SUMMARY ENVIRONMENT PLAN

Otway deep marine seismic survey

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ACRONYMS AND ABBREVIATIONS

Acronym/abbreviation	Description
°C	Degrees Celsius
2D	2-dimensional
3D	Three Dimensional
AA	Access Authority
AASM	Airgun Array Source Model
ADIOS2	Automated Data Inquiry for Oil Spills
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AHS	Australian Hydrographic Service
AIMS	Australian Inter-service Incident Management System
ALARP	As Low as Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
AMSA RCC	Australian Maritime Safety Authority Rescue Coordination Centre
ANSI	American National Standards Institute
ARPA	Automatic Radar Plotting Aid
BACI	Before and after control impact
BIA	Biologically Important Area
BSCZSF	Bass Strait Central Zone Scallop Fishery
BTEX	Benzene, toluene, ethylbenzene and xylenes
CA	Control Agency
CBF	Charter Boat Fishery
CFA	Commonwealth Fisheries Association
CMT	Crisis Management Team
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea 1972
CONOPS	Concurrent operations
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTH	Commonwealth
CTS	Commonwealth Trawl Sector
DAWR	Department of Agriculture and Water Resources (Commonwealth)
dB	Decibel
DBCA	WA Department of Biodiversity, Conservation and Attractions
DEDJTR	Department of Economic Development, Jobs, Transport and Resources (Victoria)
DoA	Department of Agriculture (Commonwealth) (now DAWR)
DoEE	Department of the Environment and Energy (Commonwealth)
DPaW	WA Department of Parks and Wildlife (now DBCA)
DPIPWE	Department of Primary Industries, Parks, Water and Environment (Tasmania)
DPTI	Department of Planning, Transport and Infrastructure (South Australia)
DSD	Department of State Development (South Australia)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth) (now DoEE)
ECR	Environmental Compliance Register
EEZ	Exclusive Economic Zone

Acronym/abbreviation	Description
EMBA	Environment that may be affected
EMS	Environmental Management System
EP	Environment Plan
EPA	Environmental Protection Authority (Western Australia) (now DWER)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPBC Regulations	Environment Protection and Biodiversity Conservation Regulations 2000
EPO	Environmental Performance Outcome
EPS	Environmental Performance Standard
ERC	Emergency Response Coordinator
ERP	Emergency Response Plan
ESD	Ecological Sustainable Development
FRDC	Fisheries Research and Development Cooperation
GAB	Great Australian Bight
GHG	Greenhouse gas
GHTS	Gillnet, Hook and Trap Sector
GMEM	Gippsland Marine Environmental Monitoring
GMP	Garbage Management Plan
GPS	Global Positioning System
HF	High frequency
HSE	Health, Safety and Environment
HSEMP	HSE Management Plan
HSEMS	HSE Management System
Hz	Hertz
IMO	International Maritime Organization
IMS	Invasive Marine Species
in3	Cubic inches
IOPP	International Oil Pollution Prevention
ISO	International Standards Organization
ISPP	International Sewage Pollution Prevention
IUCN	International Union for Conservation of Nature
JA	Jurisdictional authority
JASCO	JASCO Applied Sciences Pty Ltd
KEF	Key Ecological Feature
km	Kilometre
LAT	Lowest Astronomical Tide
LF	Low frequency
Lpk	The maximum instantaneous sound pressure level (SPL) or zero-to-peak SPL
m	Metres
m/s	Metres per second
MARPOL	International Convention for the Prevention of Pollution from Ships
MDO	Marine diesel oil
MEP	Marine Environment Protection
MERCOM	Maritime Emergency Response Commander
MF	Mid-frequency
MFA	Mean field aligned coordinate system.

Acronym/abbreviation	Description
MFO	Marine Fauna Observer
MMOA	Marine Mammal Observer Association
MNES	Matters of National Environmental Significance
MoC	
MOSES	Marine Oil Spill Equipment System
MSF	Marine Scalefish fishery
MSIC	Maritime Security Identification Card
MSS	Marine Seismic Survey
NATPLAN	National Plan for Maritime Environmental Emergencies
NEATS	National Offshore Petroleum Titles Administrator
NEBA	Net Environmental Benefit Analysis
NM	Nautical mile
NMFS	National Marine Fisheries Service
NNTT	National Native Title Tribunal
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NOx	Nitrogen oxides
NSW	New South Wales
NW	North west
OBN	Ocean bottom nodes
OCS	Offshore constitutional settlement
OGUK	Oil and Gas UK
OIW	Oil in water
OPEP	Oil Pollution Emergency Plan
OPGGS Act	*Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSMP	Operational and Scientific Monitoring Program
OSRA	Oil Spill Response Atlas
OSTM	Oil Spill Trajectory Modelling
PAM	Passive acoustic monitoring
PBW	Pygmy blue whale
PERR	Post-survey Environmental Review Report
PIRSA	Department of Primary Industries and Regions South Australia (South Australian)
PMST	Protected Matters Search Tool
POLREP	Oil Pollution Report
psi	Pounds per square inch
PTS	Permanent Threshold Shift
QLD	Queensland
RCC	Rescue Coordination Centre (AMSA)
RMS	Root-mean-square
RO	Reverse osmosis
RPS	RPS Australia West Pty Ltd
RSL	Received sound levels
SA	South Australia

Acronym/abbreviation	Description
SAMSCAP	South Australian Marine Spill Contingency Plan
SAR	(Satellite-mounted) synthetic aperture radar
SEA	Survey Environmental Advisor
SEL	Sound exposure level
SELcum	Size-dependent cumulative
SESSF	Southern and Eastern Scalefish and Shark Fishery
SETFIA	South East Trawl Fishing Industry Association
SFR	Statutory fishing rights
SGSHS	Shark Gillnet and Shark Hook Sectors
SHS	Scalefish Hook Sector
SIMA	Spill Impact Mitigation Assessment
SITREP(S)	Situation report(s)
SIV	Seafood Industry Victoria
SMP	Scientific Monitoring Plan
SMRU	Sea Mammal Research Unit
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SOx	Sulphur oxides
SPA	Special Prospecting Authority
SPF	Small Pelagic Fishery
SPL	Sound Pressure Level
SSJF	Southern Squid Jig Fishery
SST	Sea surface temperature
SSV	Sound source verification
TAC	Total allowable catch
TAFI	Tasmanian Aquaculture and Fisheries Institute
TAS	Tasmania
TASPLAN	Tasmanian Marine Oil Spill Contingency plan
TBOSIET	Tropical Basic Offshore Safety Induction and Emergency Training
TEC	Threatened Ecological Community
TGCF	Tasmanian Giant Crab Fishery
TMPC	Tasmanian Marine Pollution Controller
TSSC	Threatened Species Scientific Committee
TTS	Temporary Threshold Shift
UTM	Universal transverse mercator
VFA	Victorian Fishing Association
VIC	Victoria
WGS84	World Geodetic System 1984

1 INTRODUCTION

1.1 Purpose

Spectrum Geo (Spectrum) are proposing to undertake the Otway Deep three-dimensional (3D) marine seismic survey (MSS) in the Otway Basin as described in the Spectrum Otway Deep MSS Environment Plan accepted by NOPSEMA on 13 June 2019.

The content of this Environment Plan (EP) Summary has been developed to address the elements required by the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, following the Guideline for Environment Plan summaries (N04750-GL1566) released by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on 17 April 2019.

1.2 Details for Spectrum's nominated liaison person

Spectrum will be the Titleholder of the Special Prospecting Authority (SPA) and Access Authorities (AA) under the OPGGS Act. Access Authorities (AAs) will be applied for with the relevant permit area titleholders when the final survey area and timing are confirmed. An application for a SPA for 'Otway Deep MSS' has been submitted to the National Offshore Petroleum Titles Administrator (NOPTA) and is currently under assessment (National Electronic Approvals Tracking System application reference number: AA7D6A).

The details of the titleholder are:

Titleholder:	Spectrum Geo Australia Pty Ltd
Business Address:	Level 3, 55 St Georges Terrace, Perth WA 6000
Titleholder Liaison Person:	Danny Chan
Business Address:	Level 3, 55 St Georges Terrace, Perth WA 6000
Direct Telephone:	+61 8 9322 1844

1.3 Location of the activity

The Otway Deep MSS will acquire seismic data over a maximum area of 9,200 km2 within the larger survey area (23,620 km2) per survey season as shown in Figure 1.1.

The seismic survey is located entirely within offshore Commonwealth waters, approximately 42 km south of the Victorian mainland and 62 km west of King Island (Tasmania) at its closest points (Figure 1.1).

The Otway Deep MSS is adjacent to permit areas T30/P and T49/P and predominantly sits over open acreage. Water depths within the survey area range from a minimum of 170 m to a maximum of 3,600 m.

The survey area is the area within which the seismic source (airguns) will be operational and seismic data will be acquired, including soft-start procedures and line runouts (required to obtain full fold coverage). There will be only one seismic vessel acquiring data in the survey area during a survey season, and there will only be one survey undertaken within a survey season. The seismic source will not be operational outside of the survey area. An Operational Area or 'buffer' around the survey area is required for activities including streamer deployment and retrieval, maintenance and recovery, and vessel manoeuvring (line turns). There will be no seismic operations in the Operational Area. Boundary coordinates for these areas are provided in Table 1.1.

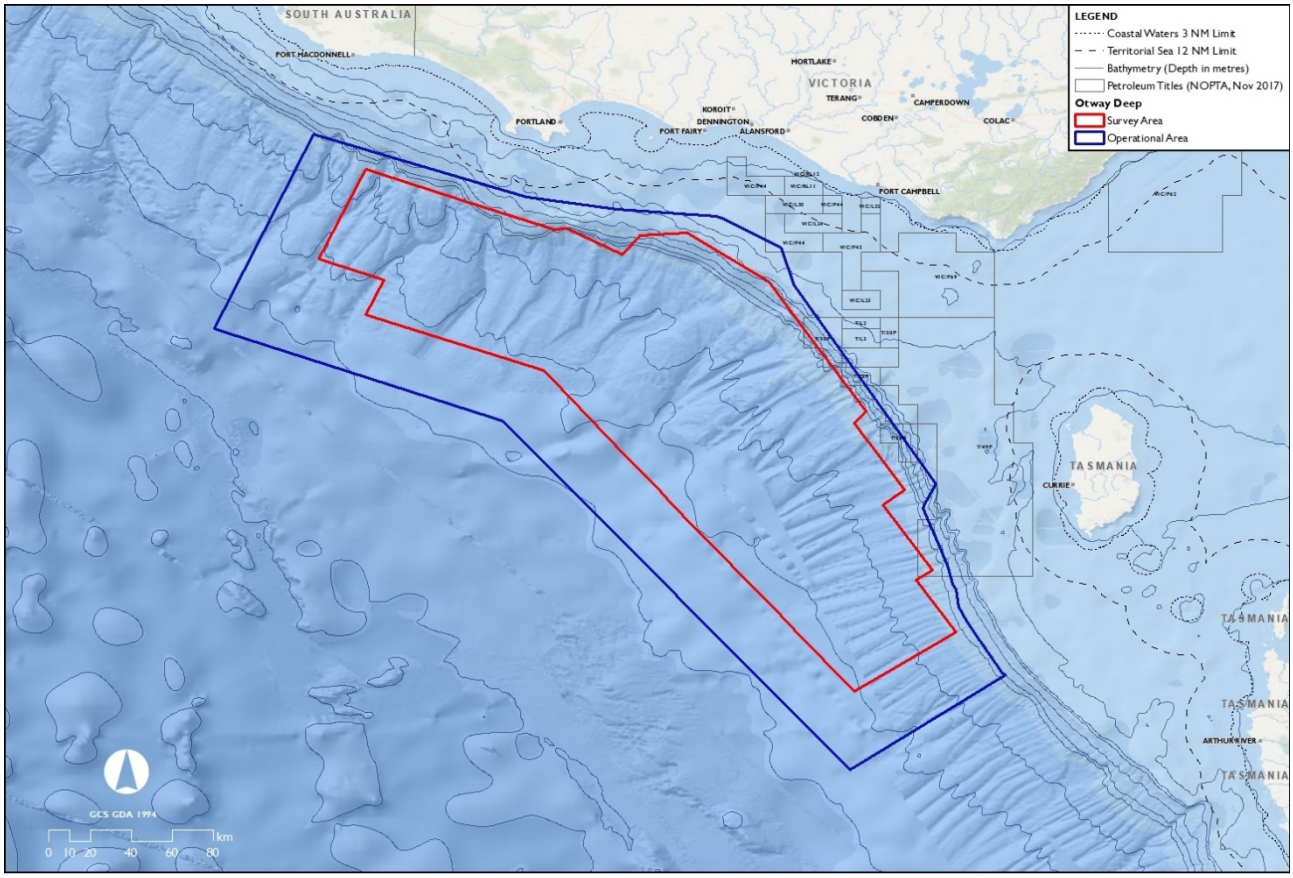

Figure 1.1: Location of the Otway deep MSS survey area

Table 1.1: Boundary coordinates for the Otway deep MSS survey area (WGS84 – UTM Zone 54S)

Description	Longitude	Latitude
Operational area	E141° 27' 19.055"	38° 40' 32.259" S
	E140° 31' 29.947"	38° 23' 53.858" S
	E140° 5' 22.605"	39° 14' 53.160" S
	E141° 21' 13.564"	39° 39' 15.125" S
	E142° 52' 16.768"	41° 10' 42.205" S
	E143° 33' 12.851"	40° 45' 45.342" S
	E143° 32' 11.606"	40° 45' 9.409" S
	E143° 31' 10.000"	40° 43' 50.337" S
	E143° 25' 1.644"	40° 34' 57.626" S
	E143° 22' 43.029"	40° 31' 35.961" S
	E143° 20' 52.650"	40° 27' 48.639" S
	E143° 20' 1.311"	40° 23' 12.036" S
	E143° 19' 15.106"	40° 21' 58.417" S
	E143° 18' 1.949"	40° 17' 33.205" S
	E143° 15' 16.381"	40° 10' 57.793" S
	E143° 11' 21.506"	40° 2' 2.665" S
	E143° 11' 46.439"	40° 0' 50.357" S
	E143° 14' 52.044"	39° 55' 45.004" S
	E142° 37' 36.762"	39° 3' 34.138" S
	E142° 34' 11.177"	38° 53' 43.080" S

Description	Longitude	Latitude
	E142° 18' 29.750"	38° 46' 2.696" S
	E142° 17' 17.643"	38° 45' 27.276" S
	E141° 51' 5.053"	38° 43' 36.978" S
Survey area	E141° 34' 25.576"	38° 48' 55.683" S
	E141° 13' 32.305"	38° 42' 17.486" S
	E140° 45' 7.942"	38° 33' 14.968" S
	E140° 32' 52.564"	38° 56' 45.752" S
	E140° 49' 58.874"	39° 2' 15.608" S
	E140° 45' 13.008"	39° 11' 18.092" S
	E141° 31' 57.808"	39° 26' 2.765" S
	E141° 50' 41.813"	39° 45' 29.398" S
	E142° 2' 34.908"	39° 57' 46.682" S
	E142° 4' 12.001"	39° 59' 26.897" S
	E142° 8' 23.797"	40° 3' 46.598" S
	E142° 34' 2.601"	40° 30' 7.691" S
	E142° 37' 40.133"	40° 33' 50.365" S
	E142° 53' 26.445"	40° 49' 56.636" S
	E143° 2' 3.920"	40° 44' 58.212" S
	E143° 20' 8.159"	40° 34' 31.722" S
	E143° 11' 11.705"	40° 19' 48.792" S
	E143° 9' 34.527"	40° 20' 45.218" S
	E143° 14' 0.567"	40° 18' 10.713" S
	E143° 0' 53.419"	40° 1' 5.294" S
	E143° 5' 52.702"	39° 57' 46.682" S
	E143° 6' 40.305"	39° 57' 15.076" S
	E142° 57' 38.555"	39° 45' 22.220" S
	E142° 56' 38.405"	39° 44' 3.093" S
	E142° 53' 19.109"	39° 39' 40.738" S
	E142° 56' 31.699"	39° 36' 41.598" S
	E142° 55' 36.106"	39° 35' 27.767" S
	E142° 40' 50.934"	39° 15' 49.244" S
	E142° 30' 56.960"	39° 2' 35.298" S
	E142° 9' 30.770"	38° 49' 53.629" S
	E141° 57' 9.951"	38° 50' 37.460" S
	E141° 52' 28.100"	38° 55' 35.718" S

1.4 Timing of the activity

The Otway Deep MSS will occur over two separate seasons within a five month window from the beginning of October through to the end of February the following year. The timing of the activity is subject to availability of the survey vessel for conducting the survey, client data requirements, sea state conditions suitable for marine seismic survey, and granting of the required regulatory approvals and access authorities. For this reason, Spectrum will select the survey seasons from one of the following combinations:

- Seasons 1 + 2 (1 Oct 2019 to end Feb 2020 and 1 Oct 2020 to end Feb 2021); **or**
- Seasons 1 + 3 (1 Oct 2019 to end Feb 2020 and 1 Oct 2021 to end Feb 2022); **or**
- Seasons 2 + 3 (1 Oct 2020 to end Feb 2021 and 1 Oct 2021 to end Feb 2022).

The survey would commence at the beginning of October of the selected season; however, it is possible that it could commence later than this time. In the event of a later start date, the seismic vessel would commence survey operations at the location where the seismic vessel would have progressed to had it started at the inshore survey line in October of the relevant survey season.

Each season will comprise a maximum of 120 days. The 120-day survey duration is a conservative estimate that allows for downtime due to weather, avoiding conflicts with other users and marine megafauna, and maintenance. Seismic data will be acquired over a 24-hour period, with shut-downs for routine and reactive maintenance, repairs, transit, line turns and marine fauna and stakeholder avoidance.

1.5 Seismic program

The proposed activity is a typical 3D survey similar to the majority of others conducted in Australian marine waters (in terms of technical methods and procedures). No unique or unusual equipment or operations are proposed. Spectrum is committed to reducing the survey duration of the Otway Deep MSS and thereby minimising the potential for interactions with other marine users. For this reason, Spectrum will utilise a wide-tow spread that can reduce survey duration by up to 30% over a conventional non wide-tow spread. If a vessel with wide-tow capabilities is not available for the survey, the survey duration would not exceed 120 days and the spatial extent would be reduced if necessary.

Figure 1.2 presents the indicative spatial extent of the main area of interest, which is represented by the “Otway Deep – Central” full fold seismic polygon. To allow for some flexibility, the location of the Central polygon may be adjusted to the West and/or to the South, but its overall size will not exceed 9,200 km2 per season and the survey duration will not exceed four months. It is not possible for a survey to extend across the full length of the larger survey area, i.e. encompassing the full extents of the all three scenarios (West, Central and South) because there cannot be multiple line orientations for a single 3D polygon. Indicative sail lines are also shown for the main area of interest (Otway Deep – Central) seismic polygon in Figure 1.2. Similar to other 3D surveys, these sail lines are acquired in swaths (or racetracks) and for the Otway Deep MSS, these sail lines are grouped into five swaths. The survey vessel will complete each swath in turn, starting with the inboard and working its way outboard. These areas have been prepared for the stakeholder consultation process for illustrative purposes to demonstrate the spatial extent of the potential variations within the larger survey area.

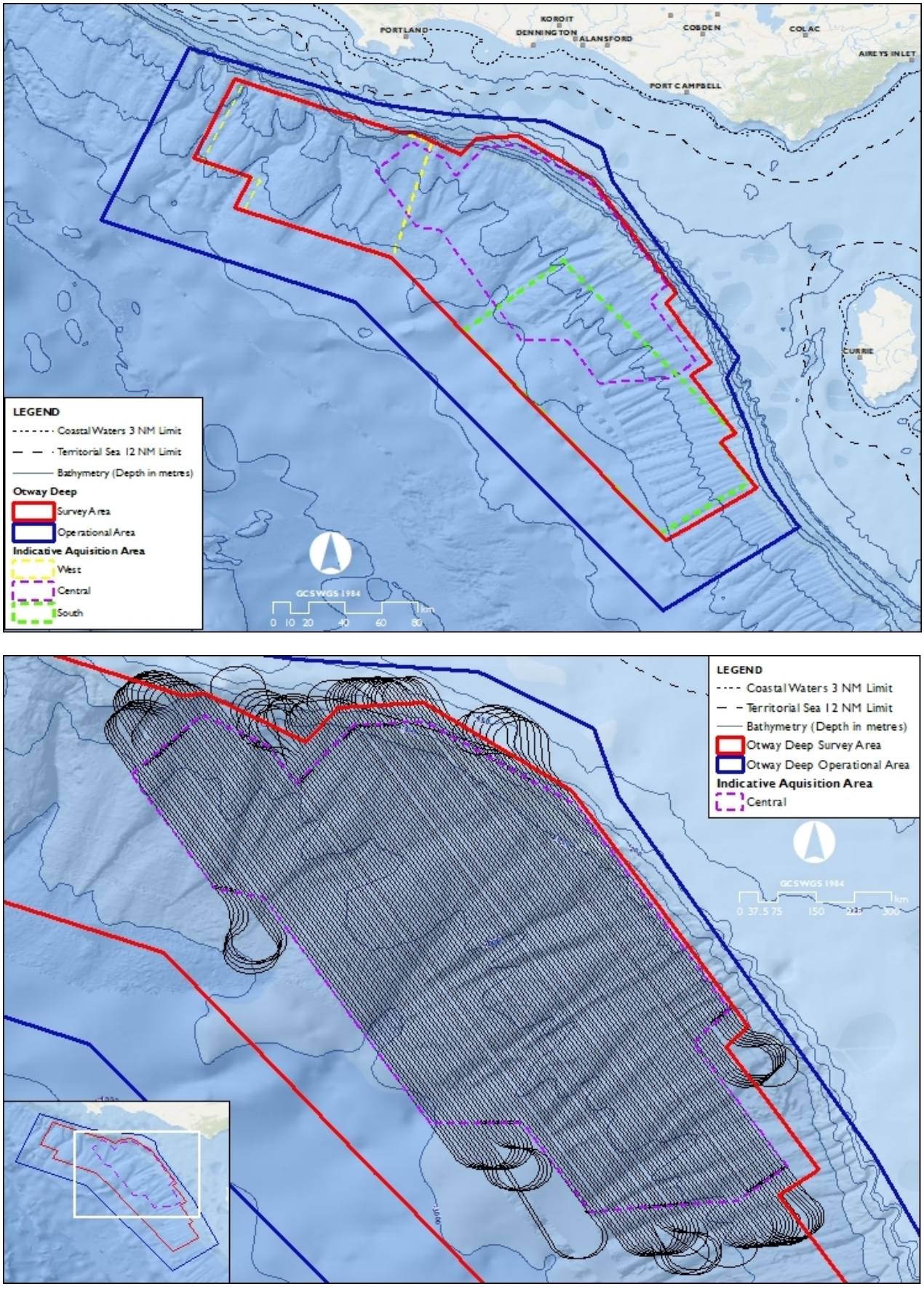

Figure 1.2: Indicative survey areas for the Otway deep MSS (above) and indicative sail lines for the Otway central survey area (below)

1.5.1 Survey parameters

The survey vessel will traverse a series of pre-determined sail lines within the survey area at a speed of approximately 4.5–5 knots. As the vessel travels along the sail lines a series of noise pulses (every 8–10 seconds) will be directed down through the water column and seabed. The released sound is attenuated and reflected at geological boundaries and the reflected signals are detected using sensitive microphones arranges along a number of hydrophone cables (streamers) towed behind the survey vessel. The reflected sound is then processed to provide information about the structure and composition of geological formations below the seabed in an attempt to identify hydrocarbon reservoirs. The seismic vessel will commence data acquisition starting at the inshore boundary of the survey area moving outward as the survey progresses.

A summary of the seismic survey parameters is provided in Table 1.2.

Table 1.2: Otway deep MSS survey parameters

Survey parameter		Description
General parameters	Survey area	9,200 km^2 (maximum area per survey season, Oct to Feb)
	Range of survey water depths in survey area[1]	170–3,600 m below lowest astronomical tide (LAT)
	Planned survey commencement date	Between 1 October 2018 to end February 2020, with avoidance of the period from 1 March to end of September
	Survey duration	Maximum 120 days per survey season
Seismic airgun array parameters	Airgun array volume (maximum)	3,475 in^3
	Operating pressure	2,000 psi
	Source volume[2]	255.1 dB re 1 µPa (L_{pk})
	Frequency range	0–25,000 Hz
	Source depth	5–8 m
	Source (shot point) interval	18.75 m
	Line spacing	750–1,000 m
	Number of streamers	10–14
	Streamer length	8,100 m
	Streamer spacing	150 m (maximum)
	Streamer depth	Towed between 12–17 m below the surface
	Streamer type	Solid

Note 1: Survey commencement date and survey window timing is subject to survey vessel availability, operational constraints and prevailing weather conditions.

Note 2: Source SPL measured values modelled by Spectrum.

1.6 Ocean bottom nodes

Spectrum may deploy ocean bottom nodes (OBN) on the seabed to augment the seismic data recorded by streamers. As the OBN units are only acoustic measuring devices, the acoustic discharge footprint will not change with the use of these units. After the completion of the survey, acoustic information from the OBNs may also be used to verify the acoustic modelling predictions presented in this EP.

Of the maximum of 20 OBN units, Spectrum will not deploy more than five in water depths shallower than 1,000 m, of which four nodes will be located in water depths of >75 m and a single node in 60 m water depth. The minimum depth for deployment will be 60 m and the maximum depth 4,500 m. The exact locations of the OBNs will be confirmed following consultation with potentially affect fishers.

The support/chase vessel will be used for the deployment and recovery of the OBNs. The OBN units will be located on the seabed for at least 30 days and for up to 120 days if weather conditions at the time preclude recovery of the units in a safe manner. Two concrete ballasts, each measuring 0.15 m in diameter and 0.63 m long, will be left on the seabed (per OBN); these will typically degrade to sand and gravel within 10 years. Figure 1.3 shows indicative locations of the OBN.

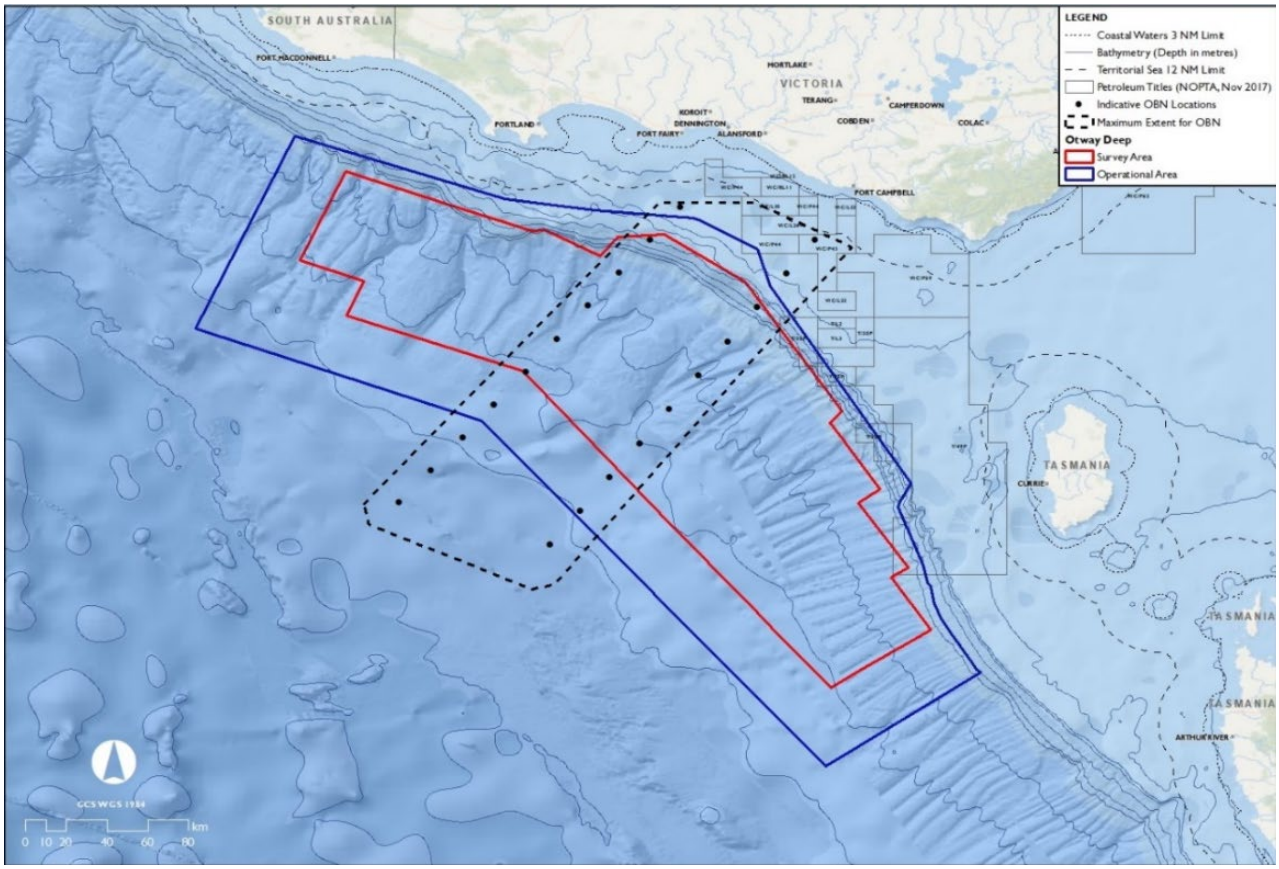

Figure 1.3 Configuration of the ocean bottom nodes for the Otway deep MSS

1.7 Survey vessels

1.7.1 Seismic vessel

Spectrum will use a purpose-built seismic survey vessel similar to the M/V Polar Empress, operated by Shearwater Geoservices. The vessel will be required to operate in accordance with Spectrum's Environmental Policy and this EP and will have an approved and tested Shipboard Oil Pollution Emergency Plan (SOPEP). The vessel will also be required to have all necessary certification/registration and be fully compliant with all relevant MARPOL and SOLAS convention requirements for a vessel of this size and purpose.

1.7.2 Support and chase vessels

The survey will include a support vessel that will accompany the survey vessel to maintain a safe distance between the towed array and other vessels, and to manage interactions with shipping and fishing activities if required. The support vessel (or chase vessel) will also be used to deploy and retrieve the OBNs, and to re-supply the survey vessel with fuel and other logistical supplies. At-sea refuelling will only take place within the Operational Area during daylight hours. Helicopters will be used to transfer crew and assist in HSE or operational emergencies as required. Crew changes are expected to occur every 35 days by helicopter. The support vessel will remain with the seismic vessel throughout the survey.

The survey spread will also include a chase vessel primarily for use in cetacean monitoring and mitigation, and other support duties if it is not engaged in its primary role (eg. during line turns). The chase vessel will be equipped with a passive acoustic monitoring (PAM) system with PAMGUARD and thermal imaging camera system. Two Marine Fauna Observers (MFOs) and one PAM operator will remain onboard the chase vessel to conduct cetacean monitoring duties.

The chase vessel will conduct monitoring activities at a distance of 10 km from the seismic vessel, i.e. the maximum distance that underwater sound modelling predicts behavioural disturbance to cetaceans.

2 DESCRIPTION OF THE EXISTING ENVIRONMENT

2.1 Defining the EMBA for the activity

OPGGS(E) regulation 13(2) requires an EP to include a description of the environment that may be affected (EMBA) by the Otway Deep MSS activity and to detail particular relevant values and sensitivities in the affected area. Two EMBAs have been defined for this EP to separate areas predicted to be impacted by the activity (planned events) from those where there is a risk of adverse effect (unplanned events)

- Activity EMBA – defines the maximum areal extent of effects from the activity and identifies the area where stakeholders may be affected by the activity (impacts). The impact assessment and identification of relevant affected stakeholders was limited to this area.

- Oil Spill EMBA – defines the maximum areal extent of effects from any unplanned events (risks) and sets the spatial boundaries for spill response actions addressed in the OPEP and associated OSMP. The risk assessment and spill response planning were based on this area.

The summarised description of the receiving environment in this chapter is based on the greater area of the Oil Spill EMBA.

2.1.1 Activity EMBA

The seismic activity will entail impacts to the receiving environment which will extend to varying distances from the survey vessel. The aspects of the activity with the greatest area of impact are underwater noise generated by the seismic source, the presence of ocean bottom nodes (OBN) and the movement of the vessel including for line turns. The maximum area covered by each of these three aspects has been combined to create an “Activity EMBA”.

The area of effect due to the aspect of the activity which will generate the highest underwater sound levels (seismic pulses) was derived from the underwater sound modelling. The area was based on the extent of underwater sound levels with potential for temporary threshold shifts (TTS) in low-frequency cetaceans. This level was selected because it:

- Covers effects on the key conservation values of the area – pygmy blue whales and southern right whales

- Covers recoverable effects on cetaceans with no lasting effects

- Protects marine fauna which are less sensitive to underwater sound

- Encompasses marine areas where sound levels may affect receptors on the seabed

- Represents cumulative sound exposure over a 24-hour period from two consecutive sail-lines

- Is consistent with the intent of the Environment Protection and Biodiversity Conservation Act (EPBC Act) Policy Statement 2.1 for managing impacts of seismic surveys on cetaceans.

The effect zone is conservatively based on 10 km inshore and along shore and 50 km offshore. This zone also covers the area of effect predicted by the modelling for behavioural disturbance to cetaceans from a single seismic shot (per-pulse), which was predicted up to a maximum distance of 9 km in all directions.

2.1.2 Oil spill EMBA

The Oil Spill EMBA was based on the predicted surface extent of an accidental oil spill as a result of vessel collision and loss of the contents of the largest fuel tank on the survey vessel. The extent of surface oil has been based on the results of ADIOS2 oil spill calculations, which predicted surface exposure from spilled oil up to 45 km from the spill location.

2.2 Regional overview

2.2.1 South-east Marine Region

The main physical features of the region, as described in the South-east Marine Region Profile (DoEE 2015a), include:

- Narrow (10 to 25 km) continental shelf in most parts of the region, except Bass Strait
- Shelf break (which includes the edges of the continental shelf and the upper slope) serves to intensify currents, eddies and upwellings, creating a rich and productive area for biodiversity, including species that are fished commercially and recreationally
- Sea floor canyons along the continental margin, which provide habitat for sessile invertebrates, such as corals, which in turn attract other organisms and higher order species
- Being oceanographically complex, with subtropical influences from the north and subpolar influences from the south.

2.3 Conservation values and sensitivities within the oil spill EMBA

2.3.1 Australian Marine Parks

Australian Marine Parks that overlap with the Oil Spill EMBA are listed in Table 2.1, along with a description of their major conservation values. Activities are required to be carried out in a manner consistent with the Australian IUCN reserve management principles and the South-east Commonwealth Marine Reserve Network Management Plan 2013-23.

Table 2.1: Australian Marine Parks within the EMBA

Marine park	Major conservation values	Relevant IUCN category	IUCN management reserve principles
South-east Marine Region			
Nelson	• Examples of ecosystems, habitats and communities associated with the West Tasmanian Transition and associated with the sea floor features: abyssal plain/deep ocean floor, canyon, knoll/abyssal hill, plateau and slope • Important migration area for: humpback whales, blue, fin and sei whales (likely migration)	Special Purpose Zone – IUCN Category VI	The reserve or zone should be managed mainly for the ecologically sustainable use of natural ecosystems based on the following principles: • The biological diversity and other natural values of the reserve or zone should be protected and maintained in the long term. • Management practices should be applied to ensure ecologically sustainable use of the reserve or zone. • Management of the reserve or zone should contribute to regional and national development to the extent that this is consistent with these principles.
Zeehan	• Examples of ecosystems, habitats and communities associated with the Tasmania Province, the West Tasmania Transition and the Western Bass Strait Shelf Transition and associated with the sea floor features: abyssal plain/deep ocean floor, canyon, deep/hole/valley, knoll/abyssal hill, shelf and slope • Variety of seabed habitats including exposed limestone, supporting rich communities of large sponges and other permanently fixed, invertebrates on the continental shelf • Rocky limestone provides important habitats for a variety of commercially important fish species, including Australia's giant crab. • Concentrations of larval blue warehou and ocean perch indicate the area is a nursery, as well as foraging for a variety of seabirds and white shark • Broad water depth range from the shallow continental shelf (50m) to the abyssal plain (>3000 m) • Biodiversity and productivity influenced by Zeehan Current and interactions with submarine canyons	Special Purpose Zone – IUCN Category VI (18,967 km^2) Multiple Use Zone – IUCN Category VI (933 km^2)	

Marine park	Major conservation values	Relevant IUCN category	IUCN management reserve principles
	• Important migration area for blue and humpback whales • Important foraging areas for: black-browed, wandering and shy albatrosses, and great-winged and cape petrels.		
Franklin	• Examples of ecosystems, habitats and communities associated with the Tasmanian Shelf Province and the Western Bass Strait Shelf Transition and associated with the sea floor features: shelf, deep/hole/valley, escarpment and plateau • Important foraging area for: shy albatrosses, short-tailed shearwaters, Australasian gannets, fairy prions, little penguins, common diving petrels, black-faced cormorants and silver gulls	Multiple Use Zone – IUCN Category VI	

2.3.2 Ramsar sites

There is one Ramsar site, the Piccaninnie Ponds Karst Wetlands, that borders on the Oil Spill EMBA on the South Australian (SA) coastline and extends up to the border with Victoria (VIC). The Ramsar site is an exceptional example of karst and coastal fen wetlands, with groundwater springs. The wetlands also support a number of nationally threatened bird species.

2.3.3 State protected areas

There are seven state protected marine parks and reserves that are located along the South Australia (SA), VIC and Tasmanian (TAS) shorelines within the Oil Spill EMBA (Table 2.2). None overlap the Activity EMBA.

Table 2.2: State protected marine parks and reserves within the oil EMBA

Protected area	Distance from operational area	Summary of values
Lower South East Marine Park, SA	49 km	• Diverse range of habitats ranging from high-energy sandy beaches and freshwater springs, various reef types, kelp forests and algal communities and is strongly influenced by natural processes such as the Bonney Upwelling • Includes Piccaninnie Ponds Conservation Park • Many important sites for seabirds and local and migratory shorebird • Includes commercial fisheries for abalone, rock lobster, scalefish and giant crab, tourism (recreational and charter fishing), and the traditional associations of the land and areas of the marine park belonging to the Buandig Aboriginal people
Discovery Bay Marine National Park, Victoria	26 km	• Rich diversity of marine life due to the cold, nutrient-rich waters of the area. Diverse array of invertebrates (e.g. southern rock lobster, black-lip abalone and gorgonians) • Part of the Ngootyoonggunditj Ngootyoong Mara South West Management Plan. Key values include roosting, feeding and nesting areas for shorebirds, subtidal reefs with giant kelp forest communities and surfing and boating • Supports great white sharks and pygmy blue whales during the summer breeding season
Twelve Apostles Marine National Park Victoria	46 km	• Submarine network of towering canyons, caves, arches and walls with a large variety of seaweed and sponge gardens, supports reef fish, highest diversity of intertidal and sub-tidal invertebrates • Managed under the 'management plan for Twelve Apostles Marine Park and the arches marine sanctuary'
Merri Marine Sanctuary, Victoria	42 km	• Intertidal reef, sand, shallow reef and rocky overhangs nursery for many fish species and a habitat for many algal species, hardy invertebrates and shorebirds. Bottlenose dolphins and fur seals • Managed under the Merri Marine Sanctuary management plan

Protected area	Distance from operational area	Summary of values
Arches Marine Sanctuary, Victoria	47 km	• Ecologically significant, supporting habitats such as kelp forests and a diverse range of sessile invertebrates on the arches and canyons, habitats support reef fish, seals and a range of invertebrates such as lobster, abalone and sea urchins • Spectacular dive site of limestone formations, rocky arches and canyons. • Managed under the management plan for Twelve Apostles Marine National Park and the Arches Marine Sanctuary
Porky Beach, Cataraqui Point Conservation Areas, Tasmania	>60 km	• Under the management of the Parks and Wildlife Service. There are no specific management actions for these reserves

2.3.4 Key ecological features

Two Key Ecological Features (KEFs) deemed regionally important for preserving biodiversity or ecosystem function and integrity are present within the extent of the Oil Spill EMBA– the Bonney Coast Upwelling and West Tasmanian Canyons KEFs (Table 2.3)

Table 2.3: Key ecological features (KEFs) within the oil spill EMBA

Key ecological features (KEFs)	Description
South-east Marine Region	
Bonney Coast Upwelling -24.5 km from the Otway Deep survey area, 14km from Operational Area	The Bonney Coast Upwelling is a predictable, seasonal upwelling bringing cold nutrient-rich water to the sea surface and supporting regionally high productivity and high species diversity (DoEE 2015). It is one of 12 widely recognised and well-known areas worldwide where blue whales are known to feed in relatively high numbers (DoEE 2015). Pygmy blue whales (*Balaenoptera musculus*) and many endangered and listed species aggregate to feed on krill during these upwellings. The high productivity supports other higher predator species such as little penguins and Australian fur seals feeding on baitfish (DoEE 2015).
West Tasmania Canyons - within the Activity EMBA	The Canyons are on the edge of the continental shelf offshore of the north-west corner of Tasmania and as far south as Macquarie Harbour. These canyons can influence currents, act as sinks for rich organic sediments and debris, and can trap waters or create upwellings that result in productivity and biodiversity hotspots (DoEE 2015). The Canyons support a diversity of sponges comparable to that of seamounts (DoEE 2015b), concentrated near the canyon heads, with the greatest diversity between 200 and 350 m depth. Sponges are associated with abundance of fishes

2.4 Physical environment

The area is typical of a cool temperate region with cold wet winters and warm dry summers. Winds are predominantly south-westerly cycling to north-westerly averaging 7 m/s and maximum wind speed across the survey months is 17.4 m/s.

Water depths vary throughout the survey area from 170 to 3,600 m. The sea floor features of the region are diverse and include seamounts, canyons, escarpments, soft sediments and rocky reefs.

Ocean currents in the Bass Strait are primarily driven by tides, winds and density-driven flows. The average current speed for the survey months (October to February) is 0.2 m/s.

Satellite remote sensing of sea surface temperature (SST) revealed there are particular locations where upwelling cells regularly develop during the austral summer and autumn (November to late April) (Baylis, Page & Goldsworthy 2008). Consequently, cold-water plumes are often observed at the surface and are associated with increased nutrient concentrations that support elevated levels of primary and consequently secondary and tertiary productivities (Baylis, Page & Goldsworthy 2008).

Tides are semi-diurnal with some diurnal inequalities, generating tidal currents along a north-east/south-west axis, with speeds generally ranging from 0.1 to 2.5 m/s. The average wave height for the Otway Deep MSS survey months (October to February) is 2.9 m and maximum height across the survey months is 7.0 m.

The waters of the Bass Strait have an average surface temperature ranging between 14 °C in winter and 21 °C in summer. However, subductions of cooler nutrient rich water (upwellings) occur along the sea floor during mid to late summer, though this is usually masked in satellite images by a warmer surface layer.

Sections of the continental shelf, including Bass Strait, possess a mosaic of rocky reefs and soft sediments, supporting a wide range of species from broad taxonomic groups. A key ecological feature of the region is the deep sea-floor canyons ranging from 200-3000m in depth (DoEE 2015a).

2.5 Biological environment

2.5.1 Threatened ecological communities

Two 'Threatened Ecological Communities' (TECs) listed as Matters of National Environmental Significance (MNES) under the EPBC Act were identified in a Protected Matters Search Tool (PMST) report as occurring within the Oil Spill EMBA (but not in the Activity EMBA).

'Subtropical and Temperate Coastal Saltmarsh' occur in shallow waters within the Oil Spill EMBA; the nearest known location approximately 37 km north of the Otway Deep MSS Operational Area. The saltmarsh provides important habitat for invertebrates, fish, birds and mammals (DSEWPaC 2013a). The conservation advice identifies pollution from oil spills as a major potential threat.

'Giant Kelp Marine Forests of South East Australia' is listed as an 'endangered' TEC and is protected under the EPBC Act. The TEC is defined as 'giant kelp growing typically at depths greater than 8 m below sea level and forming a closed or semi-closed surface or sub-surface canopy' (DSEWPaC 2012). The nearest location being approximately 24 km north of the Otway Deep MSS Operational Area near Portland.

2.5.2 Benthic habitats and communities

The dominant benthic habitat throughout the area is medium to coarse carbonate sands with areas of low relief exposed to limestone. The carbonate sands in the Otway middle shelf support a benthic fauna dominated by bryozoans, infaunal echinoids and assemblages of sponges, bivalves, scallops and small gastropods.

2.5.3 Plankton

The Bonney Upwelling is described as a productivity hotspot with high densities of zooplankton, an important food source for fish and whales. The coastal krill, Nyctiphanes australis, is of particular importance to the region providing an important link in the blue whale food chain.

Distributions of the different species of plankton are dependent on prevailing ocean currents that flow into and from the Bass Strait into Southern Ocean water masses. Plankton populations near the Operational Area are expected to be highly variable both spatially and temporally and are likely to comprise characteristics of tropical, Bass Strait, Tasman and southern Australia populations.

2.5.4 Marine invertebrates

Invertebrate diversity is high in southern Australian waters although distributions of species are patchy. Marine invertebrates in the region include porifera (sponges), cnidarians (jellyfish and octocorals), bryozoans (microscopic filter feeders), arthropods (sea spiders), crustaceans (rock lobster, giant crab), molluscs (scallops, sea slugs and squid), echinoderms (urchins, sea cucumbers) and annelids (polychaete worms).

While corals are generally associated with tropical waters, two records of deepwater octocorals are present within the Oil Spill EMBA. Deepwater octocorals occur along the slopes of the deep continental shelf and are generally limited to less than 1000 m water depth and are unlikely to be a dominant habitat type in the Activity EMBA (NOAA 2018).

2.5.5 Fish

2.5.5.1 Commercially important fish species

2.5.5.1.1 Snapper

Snapper (Pagrus auratus / Chrysophrys auratus) spawning generally occurs when water temperatures are equal to 18oC (Hamer & Conron 2016). Snapper are serial broadcast spawners, the spawning season occurs from late spring to summer, with a common peak in December and January, through to late February. Adults move into bays where spawning occurs in aggregations and return to coastal waters in late summer/autumn. For the western stock (found in waters west of Wilsons Promontory) the most important spawning and juvenile nursery area is Port Phillip Bay (Hamer & Conron 2016).

2.5.5.1.2 Southern rock lobster

Southern rock lobster (Jasus edwardsii) occur in depths from 1 to 200 m (Linnane, Penny & Ward 2008). The species occurs in a continuous distribution across this range and has extensive and protracted pelagic larval dispersal phase (FRDC 2015f). Larval release occurs across the southern continental shelf. After mating (April-May) the fertilised eggs are carried under the tail of the female for approximately three months before being released, typically between September and November. After hatching the larvae pass through a brief (10-14 day) nauplius phase into a planktonic, leaf-like phase called phyllosoma, which can be broadly distributed to 60 m and hundreds of kilometres offshore (Booth and Stewart 1992 in PIRSA 2013). Phyllosoma develop through a series of 11 stages over 12 – 23 months before metamorphosing in a puerulus (settlement) stage near the continental shelf break (Booth et al. 1991 in PIRSA 2013). The puerulus actively swims inshore to settle onto reef habitat in depths from 50 m to the intertidal zone (Booth et al. 1991 in PIRSA 2013).

2.5.5.1.3 Giant crab

Giant crab (Pseudocarcinus gigas) are found in waters ranging from 18-400 m with most harvesting occurring at depths between 140-270 m (Levings et al. 2001; VFA 2010). Spawning occurs from May to August with a peak in June and July. Eggs are incubated from July through to October, with the peak period of hatching in October and November (Levings 2008). Little is known about the planktonic larval phase, but laboratory experiments indicate that it may extend for two months (Levings 2008). Female giant crabs are highly fecund and are able to store sperm to allow them to fertilise eggs over successive breeding seasons. Release of young by adult females occurs in shallower depths of the shoulder of the continental shelf (VFA 2018).

2.5.5.1.4 Gould's squid

Gould's Squid (Nototodarus gouldi) an be found in estuaries and pelagic environments to the depths of 825 m, however, are most abundant over the continental shelf between depths of 50-200 m (AFMA 2019). Larvae and juveniles are often found in shallow coastal waters (AFMA 2019). The species aggregate near the seabed during the day and move into the water column at night to feed (AFMA 2019). The species spawn throughout the year with 2-3 peaks in spawning activity and die shortly after spawning (AFMA 2019).

2.5.5.1.5 Other commercially important species

A list of commercially important finfish species likely to be captured by fisheries within the Activity EMBA is provided below in Table 2.4.

Table 2.4: Key species of state managed fisheries

State	Fishery	Key species
Victoria	Rock Lobster Fishery	Southern rock lobster
	Giant Crab Fishery	Giant crab
	Ocean (General) Fishery	Australasian snapper
	Purse Seine (Ocean) Fishery	Australian sardine

State	Fishery	Key species
Tasmania	Giant Crab Fishery	Giant crab
	Rock Lobster Fishery	Southern rock lobster
	Scalefish Fishery	Tiger flathead
		Silver warehou
		Australian sardine
South Australia	Marine Scalefish Fishery	King George whiting
		Australasian snapper
	Charter Boat Fishery	Australasian snapper
		King George whiting
	Sardine (pilchard) Fishery	Australian sardine
	Giant Crab Fishery	Giant crab
	Rock Lobster Fishery	Southern rock lobster

2.5.5.1.6 Sharks

The great white shark (Carcharodon carcharias), has two biologically important areas (BIAs) included within or overlap the Activity EMBA The BIA for the distribution of the species encompasses the entire Activity EMBA and Oil Spill EMBA. The species is migratory and widely distributed across the Activity EMBA. There are two foraging BIAs for the species located off the VIC coastline around Port Fairy, and to the south of King Island, Tasmania. These foraging BIAs overlap sections of the EMBA but do not overlap any part of the operational or survey area.

Given the transient nature of the species it is likely that the great white shark may transit through the Activity EMBA and occur within the Oil Spill EMBA.

2.5.5.2 Spawning

The commercially important fish species that occur within the Oil Spill EMBA are largely broadcast spawners (i.e. species that release vast numbers of sperm and eggs into the water column, or in some cases scatter them on the substratum), with several species forming spawning aggregations on the continental shelf, shelf break and slope. The commercially important crustacean species fished in the vicinity of the survey area (i.e. southern rock lobster and giant crab) also spawn eggs but incubate them under their abdomen until hatching. Spawning species may aggregate at locations and spawn all their eggs and sperm at a specific time within a certain period, batch spawn across a region multiple times during certain seasons (e.g. pink ling and Australian sardine) or spawn continuously throughout the year (e.g. Gould's squid). Significant spawning aggregation areas are not known to occur in the vicinity of the survey area, although information regarding fish spawning in offshore regions of the Otway Basin is generally not well documented.

Consultation with State fisheries authorities (including VFA, PIRSA and the Tasmanian Seafood Council) and commercial fishing associations for fisheries permitted to operate in the survey area identified concerns over potential impacts to commercially important species spawning within the survey area during the proposed Otway Deep survey window. Spawning periods for key species of Commonwealth and State managed fisheries with a jurisdictional area that includes the survey area are shown in Table 2.5 and Table 2.6, respectively. Information provided by PIRSA during consultation regarding the timing of the planktonic larval phase of fishes is also shown. Note the table does not include information for key species of fisheries that overlap with the survey area but which only occur at depths shallower than the minimum depth of the survey area (i.e. at depths <170 m, such as scallops), species able to be fished in the survey area that do not spawn within the south-east marine region (such as tuna, billfish, gemfish west, John dory and mirror dory) or during the proposed survey window (such as blue warehou, sawshark and ribaldo). The spread of fish spawning periods throughout the year indicates that there are specific periods of higher sensitivity with respect to fish spawning for key fisheries species that may spawn within the Oil Spill EMBA during the proposed survey window with these predominantly occurring during late-spring.

Table 2.5: Spawning information for key species of Commonwealth managed fisheries with a jurisdictional area that includes the survey area

Fishery	Key species	Depth range (m)*	Spawning period+												Source	Additional information
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Southern and Eastern Scalefish and Shark Fishery (SESSF)	**SESSF – Commonwealth trawl sector**															
	Blue grenadier	0–1000					■	■	■	■	■	■			Gunn et al. (1989)	Spawn once during the spawning period. The main spawning areas are located off the central west coast of mainland TAS (Gunn et al. 1989) and eastern VIC/ southern NSW (Bruce et al. 2001).
	Tiger flathead	10–400	■	■										■	Kailola et al. (1993)	Mature fish migrate to shallow continental shelf waters prior to the spawning period (AFMA 2017). Eggs and larvae are thought to be pelagic (Rowling 1994).
	Silver warehou	27–650							■	■	■	■			Kailola et al. (1993)	Form spawning aggregations close to the sea bed and spawn once during the spawning period (AFMA 2017). Major spawning areas are located off the west coast of mainland TAS and southern NSW, although the distribution of larvae suggests that spawning activity occurs at lower levels more or less continuously between these regions (CSIRO 2002).
	Pink ling	40–700 (CSIRO 2002)			■	■	■	■	■	■	■	■			Kailola et al. (1993)	Spawn multiple times over an extended period (CSIRO 2002). Move into shallower continental shelf waters prior to spawning with aggregations reported from the eastern Bass Straight, off the central west coast of mainland TAS and southern NSW (CSIRO 2002).
	Blue warehou	50-300						■	■	■	■				AFMA (2018j)	Spawning occurs during winter and early spring, with primary spawning grounds off western Victoria and Tasmania (AFMA 2018j). Females spawn approximately 3 times a spawning season (AFMA 2018j).
	Jackass morwong	10-400		■	■	■									AFMA (2018a)	Spawning occurs multiple times form late summer to autumn, with females producing 0.1-1million eggs per spawning season depending on their body size (AFMA 2018a).
	Ocean perch	250-350						■	■	■	■	■	■	■	AFMA (2018d)	Spawning occurs over an extended period from winter to early summer. Spawning is distinctive to the species in that fertilisation and larvae development is internal (AFMA 2018d).
	School shark	0-550	■											■	AFMA (2018g)	School shark are ovoviviparous and produce pups every 2-3 years. Births occur in early summer after a 12 month gestation period (AFMA 2018g).
	Silver trevally	10-230	■	■	■	■	■				■	■	■	■	AFMA (2018h)	Spawning occurs over an extended period from spring to autumn, in both estuaries and deeper waters. Silver trevally are serial spawners with multiple batches of eggs being released over the spawning season (AFMA 2018h).

Fishery	Key species	Depth range (m)*	Spawning period+												Source	Additional information
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	SESSF – gillnet, hook and trap sector															
	Blue-eye trevalla	40–1500													Kailola et al. (1993)	Move into shallower depths (320–400 m) and form spawning aggregations over rough ground and drop-offs on the continental slope, as well as over seamounts (Kailola et al. 1993). Spawning is widespread across the South-east Marine Region (CSIRO 2002) although most spawning activity occurs in waters from central NSW to north-eastern TAS (AFMA 2017).
	Pink ling	See above	See above												See above	See above
	Blue warehou	See above	See above												See above	See above
	Jack morwong	See above	See above												See above	See above
	School shark	See above	See above												See above	See above
Small Pelagic Fishery	Jack mackerel	10–460													Kailola et al. (1993), CSIRO (2002)	Spawning occurs throughout the species' range across southern Australia but is regionally variable in its timing (CSIRO 2002). Spawn multiple times during the spawning season (AFMA 2017), taking place near the edge of the continental shelf with eggs and sperm released among schooling fish deep in the water column (CSIRO 2002). Larvae are thought to be carried inshore by currents (Marshall et al. 1993).
	Redbait	86–500													(Ewing and Lyle 2009)	Spawn on the outer continental shelf, mostly at night, once every three to five days over the spawning period (Ewing and Lyle 2009).
	Australian sardine	0–200	SA	SA	SA	SA	SA	SA			VIC/TAS	VIC/TAS	VIC/TAS	VIC/TAS	Izzo et al. (2012), PIRSA (2018, pers. comm., 7 March)	Distinct populations overlap within the survey area including a VIC stock centred around Port Phillip Bay, a SA stock centred around Spencer Gulf and a TAS stock for which little information exists (Izzo et al. 2012). Spawning seasons vary between the SA population and those from the VIC/TAS region exists (Izzo et al. 2012). Spawning occurs multiple times during the respective spawning seasons (Izzo et al. 2012). Spawning takes place in shelf waters with larvae moving inshore towards bays and inlets during a planktonic period of around 120 days after hatching (Izzo et al. 2012; PIRSA 2018, pers. comm., 7 March).
Southern Squid Jig Fishery	Gould's squid	0–700													AFMA (2017)	Spawn continuously throughout the year (AFMA 2017).

Table 2.6 Spawning periods information for key species of state-managed fisheries with a jurisdictional area that includes the survey area

Key species	Depth range (m)*	Spawning period†													Additional information
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Southern rock lobster	<150						Spawning	Spawning	Spawning	Hatching	Hatching	Hatching		VFA (2018)	Following mating in late-summer and autumn, females spawn eggs and hold them below the abdomen until they hatch (VFA 2018). The larval stages spend from 9–24 months at sea (the longest known for any marine organism) and become widely distributed before metamorphosing to post-larval puerulus, which swim towards the coast and settle (VFA 2018) .
Giant crab	18–400 (Levings 2008)					Spawning	Spawning (peak)	Spawning	Incubation	Incubation	Hatching (peak)	Hatching		Levings (2008)	Females spawn eggs in winter, holding them below their abdomen until they hatch them in late-spring (Levings 2008).
Australasian snapper	0–200													Coutin et al. (2003)	Spawning generally occurs in waters less than 50 m deep (Kailola et al. 1993). Within VIC waters spawning predominantly occurs in Port Phillip Bay, where mature snapper form spawning aggregations from mid-December to mid-January (Coutin et al. 2003). Snapper larvae remain inshore in shallow waters (Coutin et al. 2003).
Australian sardine	See above	See above												See above	See above
King George whiting	2–200													PIRSA (2018, pers. comm., 7 March)	Spawning aggregations form around reefs in SA continental shelf waters up to a depth of 50 m (Jenkins et al. 2000). Larvae are planktonic for 120 days and move inshore to sheltered bays and estuaries (PIRSA 2018, pers. comm., 7 March). Spawning is not known to occur in VIC or TAS waters (Hamer et al. 2004).

* Species depth ranges sourced from www.fishbase.org (Forese & Pauly 2018), unless otherwise stated.

† Green cells indicate spawning period, yellow cells indicate planktonic larval phase information provided by PIRSA during consultation; blue = peak

2.5.6 Marine reptiles

Three species of marine turtles listed as MNES under the EPBC Act were identified as potentially occurring in the Oil Spill EMBA. No marine turtle BIAs (e.g. foraging, inter-nesting, mating and nesting) are recorded within the Oil Spill EMBA. There is however, evidence that marine turtles utilise southern waters off South Australia, Victoria and Tasmania for foraging and migration to a greater extent than was previously thought. Loggerhead and leatherback turtles account for the greatest number of sightings (along the South Australian coast and the west coast of King Island, Tasmania).

2.5.7 Marine mammals

The PMST report identified 11 marine mammals species listed as 'threatened' and/or 'migratory' MNES under the EPBC Act that may potentially occur within the Oil Spill EMBA; 10 cetaceans (consisting of seven baleen whale species and three toothed species) and one pinniped (Australian sea lion, Neophoca cinerea). These are identified in Table 2.7 and described briefly in the following sections.

Table 2.7: Marine mammal species (threatened, migratory and/or with a BIA) or species habitat within the oil spill EMBA

Scientific name	Common name	EPBC Act status		BIA within oil spill EMBA	Relevant plan
		Threatened	Migratory		
Cetaceans					
Balaenoptera bonaerensis	Antarctic minke whale	N/A	Yes	No	N/A
Balaenoptera borealis	Sei whale	Vulnerable	Yes	No	*Balaenoptera borealis* (sei whale) conservation advice (TSSC 2015a)
Balaenoptera musculus	Blue whale	Endangered	Yes	Yes	Blue Whale Conservation Management Plan (DoEE 2015)
Balaenoptera physalus	Fin whale	Vulnerable	Yes	No	*Balaenoptera physalus* (fin whale) conservation advice (TSSC 2015b)
Caperea marginata	Pygmy right whale	N/A	Yes	No	N/A
Eubalaena australis	Southern right whale	Endangered	Yes	Yes	Conservation Management Plan for the Southern Right Whale (DSEWPAC 2012)
Lagenorhynchus obscurus	Dusky Dolphin	N/A	Yes	No	N/A
Megaptera novaeangliae	Humpback whale	Vulnerable	Yes	No	N/A
Orcinus orca	Killer whale	N/A	Yes	No	N/A
Physeter macrocephalus	Sperm whale	N/A	Yes	No	N/A
Pinnipeds					
Neophoca cinerea	Australian sea lion	Vulnerable	No	No	Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) (DSEWPaC 2013d)

2.5.7.1.1 Pygmy blue whale

The northern and north-eastern area of the Otway Deep Activity EMBA overlaps the pygmy blue whale BIAs for foraging and migration. The foraging BIA comprises three areas with high, variable and possible levels of usage by pygmy blue whales, and includes offshore waters from Robe, SA to Cape Otway, VIC and includes the Bonney Upwelling. Pygmy blue whales are known to feed predominantly on krill (Nyctiphane australis) within the foraging BIA from November to May, coinciding with the upwelling events.

Pygmy blue whales generally start in the in the eastern Great Australian Bight (GAB) waters at the beginning of the upwelling season and move through SA waters into VIC waters during January to April, peaking in February (Gill et al. 2011).

2.5.7.1.2 Southern right whale

The southern right whale (Eubalaena australis) have calving/nursery grounds primarily found off southern WA and off the far west of SA. The Warrnambool coastal aggregation area in VIC is small compared to other aggregation areas in Australia (e.g. Head of the Bight in SA and Doubtful Island Bay and Israelite Bay in WA). With the peak of the season from July to August)(DSEWPaC 2012). Emerging aggregation areas comprising have also been identified in coastal waters off Peterborough, Port Campbell, Port Fairy and Portland in Victoria (DSEWPaC 2012). Depth is the most important factor for habitat selection within aggregation areas, with whales preferentially occupying water depths less than ten metres (DSEWPaC 2012).

The closest aggregation and calving location to the Otway Deep Activity EMBA is Bridgewater Bay, Portland, which lies two km north of the Operational Area and 11.4 km north of the survey area at its closest points.

2.5.7.1.3 Other marine mammals

Due to the uncertainties associated with the exact migratory paths, foraging and breeding areas, there is the potential that the Antarctic minke whale (Balaenoptera bonaerensis) may be encountered within the Oil Spill EMBA.

The sei whale (Balaenoptera borealis) has been identified in the Oil Spill EMBA including in the Bonney Upwelling region off SA (24 km NW of the survey area) (TSSC 2015a), but is unlikely to be present within the survey area.

The fin whale (Balaenoptera physalus) has been sighted inshore in the proximity of the Bonney Upwelling, and along the continental shelf in summer and autumn months (Gill & Morrice 2003). This suggests this species may be encountered in the Oil Spill EMBA and within the Activity EMBA but will be more common in areas of upwelling outside the survey area.

The pygmy right whale (Caperea marginata), killer whale (Orcinus orca) are both likely to be encountered within the Oil Spill EMBA and the Activity EMBA.

Sperm whales (Physeter macrocephalus) are often associated with submarine canyons, so it is possible that both species utilise areas within the Oil Spill EMBA for foraging and may be encountered in the Operational Area and the survey area, however, there are other areas around the coast of Australia which are predicted to have a higher habitat value than that present within the Oil Spill EMBA.

The humpback whale (Megaptera novaeangliae) does not have a BIAs identified within or in the vicinity of the Otway Deep MSS Operational Area or the Oil Spill EMBA. The Conservation Advice for Humpback Whales (TSSC 2015d) does, however, identify the area of the Otway Deep MSS west of King Island as ‘Likely Species Range’, where humpback whales may be present on a seasonal basis. The advice further identifies migration periods for humpback whales around the western side of King Island as being between April and May (northbound) and November and December (southbound) (TSSC 2015d).

The Australian sea lion (N. cinerea) generally hauls out (rests) and breeds on rocks and sandy beaches on sheltered sides of islands, although some small colonies exist on the mainland. A recovery plan (DSEWPaC 2013d) has been developed to halt the decline of Australian sea lion populations to ensure that anthropogenic activities do not hinder recovery across their range. The sealion is unlikely to occur within the Activity EMBA or Oil Spill EMBA. The Australian fur seal (Arctocephalus pusillus) is unlikely to be encountered within the survey area but may forage within the Oil Spill EMBA. The nearest fur seal breeding colonies are Julia Percy Island and Cape Bridgewater, 35 km and 27 km from the Operational Area, respectively.

2.5.8 Birds

2.5.8.1 Seabirds

Threatened seabird species and those that have breeding colonies, important foraging areas or and/or a significant proportion of their global population within the Oil Spill EMBA are described briefly below.

There are seven albatross species with identified widespread foraging BIAs covering all or parts of the survey area and Oil Spill EMBA. Given the large, pelagic distribution of albatross, individuals may fly over the Operational Area in transit or while foraging. The locality closest to the Operational Area is Albatross Island in the Bass Strait (88 km from the Otway Deep MSS Operational Area). These species are likely to be encountered within the Oil Spill EMBA and may occur within the Operational Area.

The Fairy tern, (Sternula nereis) forage in nearshore areas of Spencer Gulf and Gulf of St Vincent in SA, and the south-west WA coast. The crested tern, (Thalasseus bergii) are very common on the Australian coastline. Both are unlikely to be encountered within the Operational Area but may occur within the Oil Spill EMBA.

The black-faced cormorant (Phalacrocorax fuscescens) has foraging and breeding BIA outside of the Oil Spill EMBA off the coast of King Island hence is unlikely to be encountered in Operational Area but may occur within the Oil Spill EMBA.

Little penguins (Eudyptula minor) have a foraging BIA within the Oil Spill EMBA and therefore little penguins are likely to be encountered within the Oil Spill EMBA but unlikely to be encountered in the Operational Area.

Three shearwater species are likely to be encountered in the vicinity of the Operational Area, and within the wider EMBA.

Six species of petrels are listed as ‘threatened’ under the EPBC Act, several having with breeding and/or foraging BIAs that overlap the Oil Spill EMBA.

2.5.8.2 Shorebirds

Migratory shorebirds may be found around wetlands along the shoreline of the Oil Spill EMBA. congregating at Ramsar sites, gathering in mixed flocks, but also occur in single-species flocks or feed and roost with resident shorebird species such as stilts, avocets, oystercatchers and plovers. The DoEE (2015b) Wildlife Conservation Plan for Migratory Shorebirds provides a framework to guide the conservation of migratory shorebirds and their habitat in Australia.

2.6 Socio-economic environment

2.6.1 Commercial fisheries

Jurisdictions of Commonwealth and State-managed fisheries that overlap the Otway Deep MSS Activity EMBA are listed in Table 2.8.

Table 2.8: Commonwealth and state-managed fisheries that may be active within the activity EMBA

Commonwealth fisheries	VIC fisheries	SA fisheries	TAS fisheries
Small Pelagic Fishery Southern Squid Jig Fishery Southern and Eastern Scalefish and Shark Fisheries • Commonwealth Trawl Sector • Gillnet, Hook and Trap Sector • Scalefish Hook Subsector • Shark Hook Subsector • Shark Gillnet Subsector	Giant Crab Fishery Rock Lobster Fishery Ocean (General) Fishery Multispecies Fishery	Marine Scalefish Fishery Charter Boat Fishery	Giant Crab Fishery Rock Lobster Fishery

2.6.1.1 Commonwealth managed fisheries

There are nine Commonwealth-managed commercial fisheries that intersect with the Oil Spill EMBA:

Based on publicly available information and the outcomes of stakeholder consultation, it was determined that only three of these nine Commonwealth-managed fisheries are likely to be active within the survey area and Activity EMBA. These are:

- Small pelagic fishery
- Southern and Eastern Scalefish and Shark fisheries
- Southern squid jig fishery.

2.6.1.1.1 Small pelagic fishery

The Commonwealth Small Pelagic Fishery (SPF) target blue mackerel, jack mackerel and redbait. The fishery operates year-round and employs purse-seine and midwater trawl fishing methods.

Although 61 entities held statutory fishing rights (SFRs) for the SPF in 2015-16 and 2016-17, there are only 22 active SRFs (licence holders) (AFMA website (https://www.afma.gov.au/fisheries-services/concession-holders-conditions). Of these only three vessels were active in the fishery during both years (Moore and Mobsby, 2017), and catches by these vessels are obtained over a broad area. Consideration of available catch data and fishing depths supports information obtained during industry consultation that overlap between the areas actively fished by these vessels and the Activity EMBA will be minimal during the annual survey windows.

2.6.1.1.2 Southern and eastern scalefish and shark fisheries

The Southern and Eastern Scalefish and Shark Fisheries include the Commonwealth Trawl Sector (CTS), the Gillnet, Hook and Trap Sector (GHTS), and the Scalefish Hook Sector (SHS). More than 100 species are regularly landed in the SSESF but only the main species are managed under quota (SETFIA 2018). At present there are 34 fish stocks subject to specific management under total allowable catches (TACs). Only those in bold are generally found in the vicinity of the Otway Deep Operational Area (SETFIA 2018). Effort in the CTS is widespread and concentrated in continental shelf and slope waters shallower than 600 m depth. There were 34 active trawlers in the fishery compared to 57 boat SFRs in 2016-17. Of these 57 SFRs there are 7 SFRs for the Great Australian Bight trawlers. Recent catch and effort in this sector is at low historic levels but demonstrates that trawling activity may overlap with the Activity EMBA.

The GHTS is further divided into the Shark Gillnet and Shark Hook Sectors (SGSHS) and the Scalefish Hook Sector (SHS). Catch and effort in the SGSHS is concentrated in VIC waters but is at historically low levels. The number of shark gillnet SFRs in the sector was 61 during 2015-16 and 2016-17 compared to 37 and 36 active gillnet vessels, respectively, during these years. Of the 61 SFRs only there are only 57 active SRFs (licence holders) which were downloaded from AFMA's website on 1 February 2019 (https://www.afma.gov.au/fisheries-services/concession-holders-conditions). The number of shark hook SFRs was 13 during 2015-16 and 2016-17, which also corresponded to the number of active SFRs downloaded from AFMA's website (refer to above website link). The fishery operates in depths shallower than 183 m and may overlap with areas of the Activity EMBA that extend onto the continental shelf.

Catch and effort in the SHS is widespread in SA, VIC, TAS and NSW waters where it is concentrated in continental shelf and slope waters to a depth of 800 m. Catch and effort in the sector is at historically low levels, with 18 and 17 vessels actively fishing in the sector during 2015-16 and 2016-17, respectively, compared to the allocation of 37 scalefish hook SFRs in both years, which also corresponded to the number of active SFRs downloaded from AFMA's website (https://www.afma.gov.au/fisheries-services/concession-holders-conditions). Information provided by a fisherman in this sector also indicates minor impact on fishing activities due to survey activities. As such there is likely to be overlap of low intensity fishing by the sector in continental shelf and slope areas of the Activity EMBA.

Table 2.9: 2018–2010 TACs (whole fish unless otherwise stated) for SESSF quota species. Species that are likely to be caught in the area of the activity EMBA are highlighted (AFMA 2018 in SETFIA, 2018)

Species	TAC (t)	Species	TAC (t)
Alfonsino	1,017	Orange Roughy – (GAB)	50
Bight Redfish (GAB)	800	Orange Roughy – (Cascade)	500
Blue Eye Trevalla	462	Orange Roughy – (East)	698
Blue Grenadier	8,810	Orange Roughy – (South)	53[20]
Blue Warehou	118	Orange Roughy – (West)	60
Deepwater Flathead (GAB)	1,128	Oreo (smooth Cascade)	150
Deepwater Shark (east)	23	Oreo (smooth other)	90
Deepwater Shark (west)	264	Oreo (basket)	185
Elephant Fish	114	**Pink Ling**	1,117
Flathead	2,507	Redfish	100
Gemfish East	100	**Ribaldo**	430
Gemfish West	200	Royal Red Prawn	381
Gummy Shark	1,763[21]	**Sawshark**	430
Jackass Morwong	505	**School Shark**	215
John Dory	263	School Whiting	820
Mirror Dory	235	**Silver Trevally**	307
Ocean Perch	241	**Silver Warehou**	600

2.6.1.1.3 Southern squid jig fishery

The Southern Squid Jig Fishery (SSJF) targets Gould's squid using squid jigs in waters across SA, TAS, NSW, VIC and southern QLD. The fishery operates at night in depths between 60 – 120 m. Squid are also caught in the Commonwealth Trawl Sector. Fishing effort for squid is widespread but relatively high in continental shelf waters near Portland, VIC). However, the amount of fishing effort in the fishery has been low in recent years, with seven vessels actively fishing with squid jigs in both 2015 and 2016. Gould's squid has highly variable stock and recruitment parameters. The fishery extends year-round although most fishing occurs from January to June. Information provided by an operator in the SSJF also indicates little overlap in the timing of seismic surveys and fishing activity.

2.6.1.2 Victorian managed fisheries

Five VIC wild-catch commercial fisheries intersect with the Oil Spill EMBA. Based on publicly available information and the outcomes of stakeholder consultation it was determined that three of these five State-managed fisheries are active within the survey area and Activity EMBA. These are:

- Rock lobster fishery
- Giant crab fishery
- Multi-species ocean fishery

2.6.1.2.1 Rock lobster fishery

The fishery extends along the entire VIC coastline across to adjacent Commonwealth waters under an offshore constitutional settlement (OCS). Commercial vessels fish nearshore waters to depths around 150 m, with the majority of catches taken in depths less than 60 m.

The key target species is southern rock lobster. The fishery operates from November to September for male southern rock lobster and November to June for female southern rock lobster. Key closed seasons are in place for male southern rock lobsters from 15 September to 15 November inclusive as well as for female southern rock lobsters from 1 June to 15 November.

In 2017 there were 4 active licence holders fishing in areas within the Operational Area. Recent catch effort data shows the fishery is operating within the Operational Area however due to depth restrictions for the species (< 15 m) fishing effort within the Operational Area is expected to be low.

2.6.1.2.2 Giant crab fishery

The fishery maintains the same boundary and management zones as the VIC Rock Lobster Fishery but fishing for giant crabs only occurs in the Western Zone as the species is not abundant in the Eastern Zone. Effort is concentrated along the continental shelf edge with pots set at depths between 150 and 300 m.

The key target species for the fishery is the giant crab. The fishery uses baited lobster pots to catch giant crabs. The closed season for female and male giant crabs is from 1 June until 15 November and from 15 September to 15 November, respectively.

Recent catch effort data shows the fishery is operating within the Activity EMBA but due to depth restrictions for the species (< 300 m) fishing effort within the Activity EMBA is expected to be medium to low in intensity.

2.6.1.2.3 Multispecies ocean fishery

The Multispecies Ocean Fishery includes the Wrasse (Ocean) Fishery, the Scallop (Ocean) Fishery and the Purse seine (Ocean) Fishery. Recent catch effort data shows that these fisheries are operating largely outside of the Activity EMBA.

2.6.1.3 Tasmanian managed fisheries

Key TAS fisheries species include salmonids (aquaculture), abalone (wild-catch), southern rock lobster (wild-catch) (Savage et. al 2016).

Six TAS wild-catch commercial fisheries intersect with the Oil Spill EMBA:

- Abalone fishery
- Commercial dive fishery
- Giant crab fishery
- Rock lobster fishery
- Scalefish fishery
- Shellfish fishery.

Based on publicly available information and the outcomes of stakeholder consultation it was determined that two of these six State-managed fisheries are active within the survey area and Activity EMBA. These are:

- Giant crab fishery
- Rock lobster fishery.

2.6.1.3.1 Giant crab fishery

The Tasmanian Giant Crab fishery includes the waters surrounding the state of TAS generally south of 39o 12’ and out to the outer edge of the Australian Exclusive Economic Zone (EEZ). The key species targeted by the fisher is the Giant Crab (Pseudocarcinus gigas). The fishing year commences on 1 March and concludes on the last day of February the following year. Fishing for male giant crabs is permitted year-round. A spawning closure for females applies from 1 June to 14 November.

There are depth restrictions for the species therefore fishing effort within the Operational Area is expected to be medium to low in intensity.

2.6.1.3.2 Rock lobster fishery

The TAS Rock Lobster Fishery extends across waters surrounding TAS generally south of 39º12′ out to 200 nm. The key species targeted by the fishery is the southern rock lobster. Closed seasons are in place within the fishery for female southern rock lobsters from 1 May to 14 November and for male southern rock lobster from 1 October to 14 November.

The catch is collected from waters around TAS, mostly <100 m deep, with southern rock lobsters only found to depths of 150 m.

Recent catch effort data shows the fishery is operating within the Operational Area however due to depth restrictions for the species fishing effort within the Operational Area is expected to be low.

2.6.1.4 South Australian managed fisheries

The jurisdiction of seven SA wild-catch commercial fisheries intersect with the Oil Spill EMBA:

- Charter boat fishery
- Marine scalefish fishery
- Miscellaneous fishery
- Giant crab fishery
- Southern rock lobster fishery
- Sardine fishery
- Abalone fishery

Based on information provided by PIRSA and stakeholder consultation, it was determined that only limited fishing activity by two of these fisheries may occur within the Activity EMBA during the period of survey activities. These fisheries are the Marine Scalefish Fishery and Charter Boat Fishery.

2.6.1.4.1 Marine scalefish fishery

The Marine Scalefish fishery (MSF) extends across all SA waters and out to the edge of the 200 nm AFZ. The deepest waters fished are generally 150 m. The fishery operates year-round however is subject to a range of seasonal spatial closures. The key species targeted by the fishery include various finfish, crustaceans, and molluscs; primarily King George whiting, southern garfish, snapper and southern calamari. Some of the target species within the MSF occur within the Activity EMBA.

Recent catch effort data shows the fishery is operating within the Operational Area, however depth restrictions for the species fished mean fishing effort within the Operational Area is expected to be low.

2.6.1.4.2 Charter boat fishery

The Charter Boat Fishery (CBF) is broadly similar to the Marine Scalefish Fishery in terms of jurisdiction and target species. The fishery operates year-round but is subject to seasonal spatial closures. Most fishing activity occurs in shallow waters, and whilst offshore fishing comprises between 10 – 20% of total activity, the amount of deepwater fishing is negligible (< 1%). The number of active licenses in the CBF shows a downward trend (59 in 2016/17) with most activity occurring in the Gulf of St Vincent and Spencer Gulf areas. Stakeholder feedback indicates that only two charter vessels were operating out of Port MacDonnell in 2018, the closest port to the Activity EMBA.

2.6.2 Native title, heritage and historic shipwrecks

A search of the National Native Title Tribunal online database (NNTT 2017) found that native title has been determined for two claims that include shoreline areas along the EMBA.

There is one National Heritage Place listed as a MNES under the EPBC Act that is situated along the shoreline of the EMBA - The Great Ocean Road and Scenic Environs Great Ocean Road and Scenic Environs – a scenic coastal drive and a popular tourist destination

There are three historic shipwrecks protected under the Historic Shipwrecks Act 1976 (Commonwealth), within the survey area and 73 shipwrecks within the Oil Spill EMBA.

2.6.3 Tourism, recreation and recreational fishing

The majority of the coast intersected by the Oil Spill EMBA is remote, with few settlements, developments or tourist facilities. Limited recreational and tourist activities occur within the Operational Area or Activity EMBA due to the distance from the coast. Marine mammal watching tours are popular in South Australia. Although recreational fishing is likely to occur in the shallower coastal waters of the Oil Spill EMBA, access to offshore areas is limited for small vessels (<8 m) due to the inaccessible coastlines and exposed waters. Several charter boats operating out of VIC ports (Portland, Port Fairy and Port Campbell), and one occasionally from King Island, which may sometimes fish continental slope waters within the Operational Area.

2.6.4 Shipping

Vessel traffic associated with commercial and recreational fishing, tourism, international shipping, and oil and gas operations is generally high throughout the Otway Basin. There is high shipping traffic in the northern part of the Operational Area as this is an important shipping route for vessels travelling between VIC, TAS and SA to the Bass Strait. Vessel traffic decreases in density to 'medium' towards the middle and south of the survey area.

2.6.4.1 Petroleum exploration and production

There have been historic 2D and 3D seismic surveys conducted in the Otway Basin. There are also production facilities inshore of the Otway Deep MSS Operational Area. A summary of planned seismic activities and petroleum operators with interests in the survey area and is provided in Table 2.10.

Table 2.10: Environment plans for activities within the vicinity of the Otway deep Operational Area

Petroleum title	Description of EP activity	Dates of operation	Stage of submission
T/L2, T/L3 and VIC/L23	Beach Energy* Otway Offshore Operations. Activity Type: Operation of a facility, Operation of a petroleum pipeline, Any other petroleum-related activity. EP Submitted 15/05/17; Accepted 17/11/17	Operations planned to continue until at least November 2022.	Active – Accepted
T49/P	3D Oil Proposed Dorrigo 3D Marine Seismic Survey. EP in preparation	Currently planned to take place between 01/10/18 and 30/04/19 – expected to take up to 35 days.	Not active – EP not submitted
VIC/L24	Cooper Energy Casino-5 Well intervention and workover – Drilling. Activity Type: Operation of a facility, Operation of a petroleum pipeline, any other petroleum-related activity. EP Submitted 24/10/17; Accepted 20/12/17	First half of 2018 – 25 days.	Accepted
VIC/L30	Cooper Energy Casino, Henry and Netherby Developments. Activity Type: Operation of a petroleum pipeline. EP Submitted 27/03/17; Accepted 01/08/17	Operations planned to continue until at least August 2022.	Active – Accepted

*Previously known as Lattice Energy Limited or Origin Energy Resources Limited.

2.6.5 Defence

There are no Department of Defence restricted areas that occur within the Oil Spill EMBA.

3 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT METHODOLOGY

3.1 Introduction

Spectrum's impact and risk management process is based on the principles, framework and processes defined by the International Standards Organization (ISO) 31000:2009 Risk Management – Principles and Guidelines (Figure 3.1).

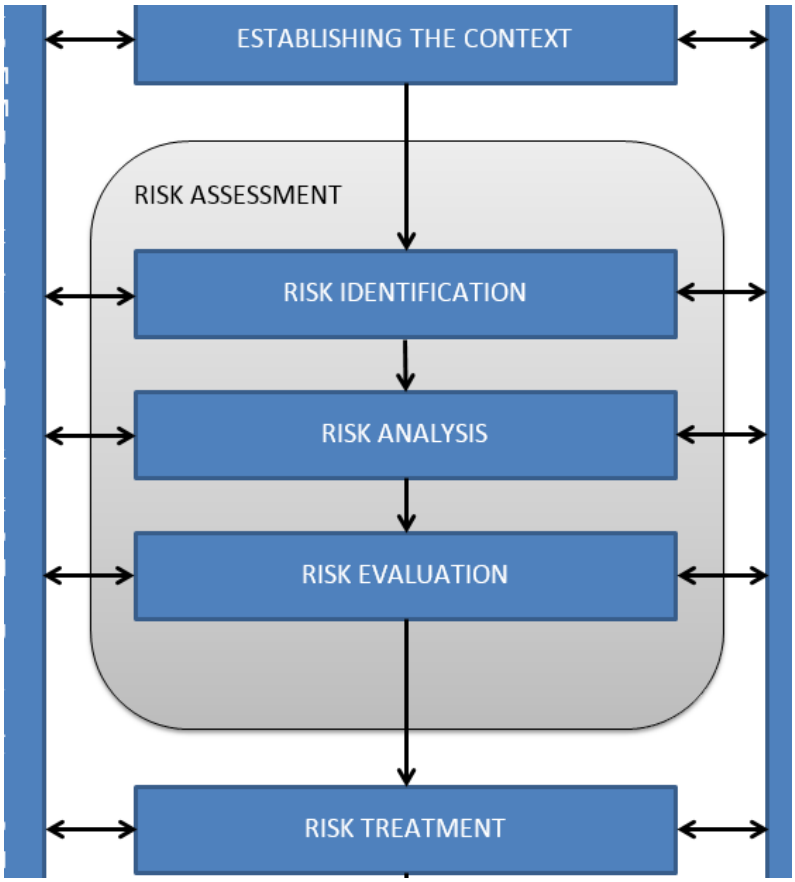

Figure 3.1: Spectrum's impact and risk management process

3.2 Communication and consultation

Communication and consultation with internal and external stakeholders take place during all stages of the risk management process. Spectrum is committed to consulting with relevant stakeholders who may be affected by the activity, to identify and understand any concerns and issues, to mitigate impacts and risks highlighted in meritorious submissions and to openly communicate the process with the stakeholders. Input from stakeholders will help to inform the preparations for and execution of the Otway Deep MSS as appropriate. The process of stakeholder engagement is described in Section 7.

3.3 Establishing the context

The external context comprises the description of the activity, the physical, biological and socio-economic environments and associated potential environmental impacts specific to the nature and scale of the activity, the legislative framework, applicable management plans, standards and guidance and the perceptions and values of external stakeholders.

The internal context relates to Spectrum's culture, processes, structure and strategy, and includes anything within the organisation that can influence the way in which environmental risk is managed.

3.4 Impact and risk assessment

Spectrum's impact and risk assessment process uses a systematic, evidence-based approach in order to evaluate and interpret the impacts and risks associated with its activity and the potential for harm to physical, biological and human receptors. The environmental impacts and risks associated with the Otway Deep MSS have been assessed using the following steps:

- Definition of the activity and identification of associated aspects and hazards with potential for environmental harm
- Identification of the environmental values within the area that may be affected by the activity
- Identification of aspects of the activity with potential for environmental harm in the context of its nature and scale and location
- Definition of acceptable levels for each impact and risk
- Identification of impacts from routine aspects and risks from unplanned/accidental events, and the inherent impact or risk
- Identification of the 'decision context' and 'assessment technique' relevant to the impact or risk
- Identification of control measures to be implemented for each aspect in order to reduce the impacts and risks to ALARP
- Determination of the residual risk of each environmental impact and risk with identified control measures adopted
- Determination of whether the residual risk is acceptable
- In the event that an impact or risk is not considered acceptable, further practical control measures are considered and adopted until the impacts and risk are considered ALARP and acceptable

3.4.1 Impact and risk identification

The identified environmental impacts and risks associated with activities proposed under this EP are assessed within Section 4 and Section 5.

3.4.2 Impact and risk analysis and evaluation

The Otway Deep MSS impact and risk assessment is based on the evaluation of impacts and risks that are credible, realistic and appropriate to the nature and scale of the activity, and the values and sensitivities of the environment that may be affected (EMBA).

Each impact and risk associated with the planned seismic activity has been evaluated by determining the consequences or effects, including the extent, duration, timing and potential for recovery, (Table 3.1 and

Table 3.2) and assessing the likelihood or probability that those consequences may occur (Table 3.3). Potential maximum quantities released, timescale of release, biological exposure and sensitivities, and regulatory requirements were considered in determining the consequence of the impact/risk. The likelihood of the effect or consequence is based largely on professional judgement of the conditional likelihoods leading to the effect, including the presence of the stressor (impact/risk), the exposure of receptors to the stressor and the sensitivity of the receptors to the stressor.

The impacts and risks associated with the activity have been evaluated in accordance with Spectrum's Impact and Risk Matrix (

Table 3.4). The outcome of this evaluation provides the 'inherent' impact or risk ranking, i.e. the impact/risk without the application of control measures. The shaded region of the risk matrix signifies the tolerability of the risk ranking.

Table 3.1: Definition of consequence terms

Term	Meaning
Localised	Activity EMBA extent
Extensive / Medium scale	Within Oil Spill EMBA extent
Regional / Large scale	Otway Basin extent
Short-term	Days to weeks
Medium term	<12 months
Long-term	>12 months

Table 3.2: Definition of consequence

Category		Definition
1	Negligible	No, or very limited, localised and short-term effect on individuals, populations, ecosystems or areas of environmental/social value. Full recovery expected in days. No, or very limited, disruption to the local community.
2	Minor	Localised and short-term effect on individuals within a population (including critical behavioural processes), habitats/communities or areas of environmental/social value. No overall effect on populations or ecosystem function. Full recovery expected in days to weeks. Localised and short-term disruption to the local community.
3	Moderate	Localised and medium-term OR extensive and short-term effect on a proportion of a species' population (including critical behavioural processes), habitats/communities or areas of environmental/social value. No overall effect on populations or ecosystem function. Recovery in months to 1 year. Localised and medium-term (months) OR extensive and short-term (days) disruption to the local community.
4	Severe	Localised and medium-term OR extensive and short-term effect on a proportion of a protected species' population (including critical habitats/behavioural processes) or protected areas. No overall effect on populations or ecosystem function. Recovery >1 to 3 years. Localised and medium-term (12 months) OR extensive and short-term (weeks) disruption to the local community. High potential for significant complaints from stakeholders.
5	Major	Localised and long-term OR extensive and medium-term effect on a species' / protected species' population (including critical habitats/ behavioural processes), or areas of environmental/social value. Injury or death of individuals of a protected species. Effects are at an ecosystem function level. Recovery >3 to 10 years. Localised and long-term OR extensive and medium-term disruption to the local community that affects local business viability.
6	Catastrophic	Regional and long-term effect on a protected species' population (including critical habitats/behavioural processes) or protected areas. Injury or death of a significant proportion of a protected species population. Effects are at an ecosystem function level. Recovery >10 years. Regional and long-term disruption to the local community and loss of viability of local businesses.

Table 3.3: Definition of likelihood

Category		Definition	Probability
A	Remote	Requires exceptional circumstances and is unlikely even in the long-term; unheard of in the industry	Event occurs once within 100 years
B	Unlikely	Has occurred elsewhere but would not be expected; has occurred once or twice in the industry	Event occurs once within 10 years
C	Possible	Has the potential to occur and has occurred many times in the industry but not before in Spectrum	Event occurs once a year
D	Likely	Expected to occur in the majority of circumstances; has occurred before in Spectrum	Event occurs within weeks to months
E	Almost Certain	Expected to occur in almost all circumstances; has occurred in the region	Event occurs within days to weeks

Table 3.4: Spectrum environmental impact and risk assessment matrix

Consequence		Likelihood				
		A	B	C	D	E
		Remote	Unlikely	Possible	Likely	Almost certain
1	Negligible					
2	Minor					
3	Moderate					
4	Severe					
5	Major					
6	Catastrophic					

Risk ranking colour code

Low | Medium | High | Very high

3.5 Impact and risk treatment

The treatment of the inherent impacts and risks identified in the assessment process requires application of control measures to reduce them ALARP and acceptable levels. Spectrum has taken the following approach for each of the identified impacts and risks during the assessment:

- Identification of appropriate control measures aligned with the decision type
- Demonstration of ALARP (and determination of the residual impact)
- Demonstration of acceptable level of impact or risk.

3.5.1 Decision context and assessment techniques

Spectrum applies the Oil and Gas UK (OGUK) (2014) Guidance on Risk Related Decision Making (Figure 3.2) to determine the assessment technique applied for each impact or risk.

The extent to which identified stakeholders have an interest in the decision depends upon the nature of the impact/risk and their perception of the impact/risk. The values, views, concerns of stakeholders consulted for the Otway Deep MSS have been used in the determination of the decision context.

Once the decision context is established for the impact/risk this determines the assessment technique to use to identify appropriate control measures. Figure 3.2 show the assessment technique(s) likely to be needed to make the decision.

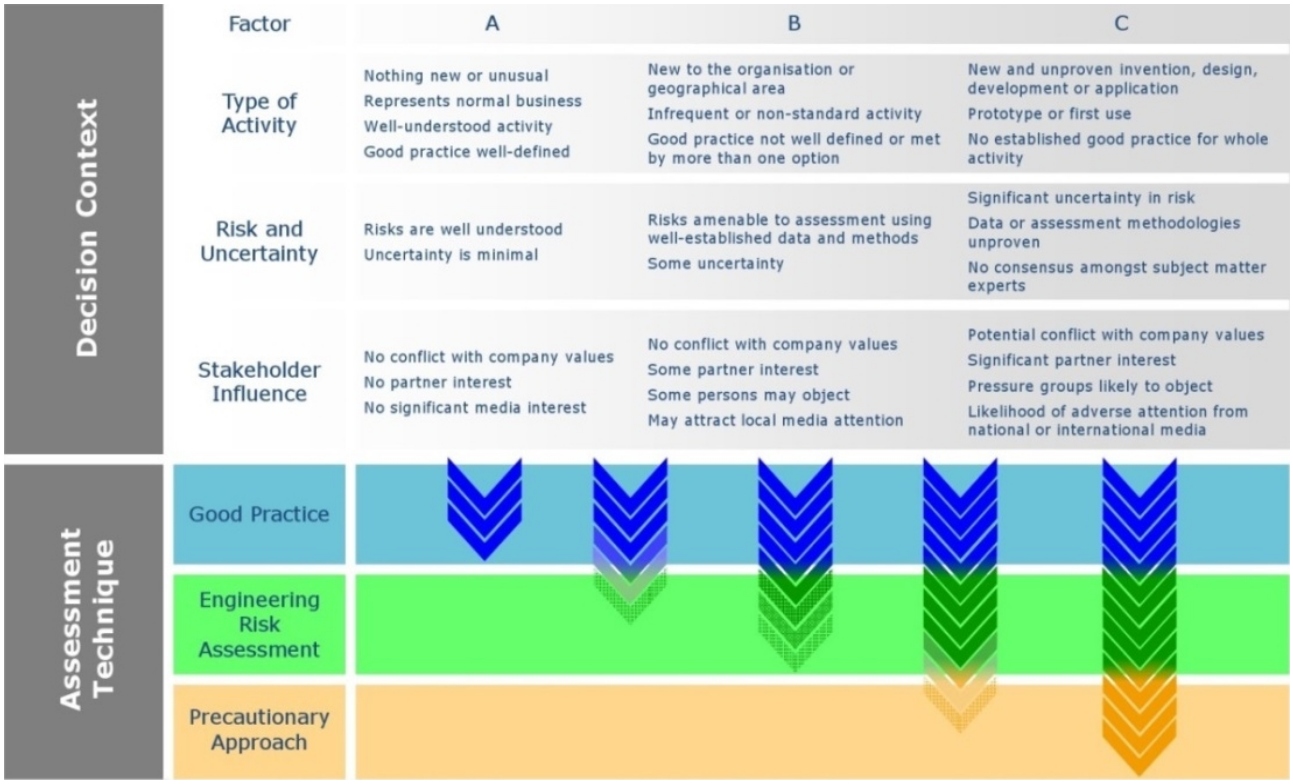

Figure 3.2: Risk related decision support framework (OGUK 2014)

3.5.2 Hierarchy of control measures

Spectrum has applied the following hierarchy of control measures to identify and select appropriate control measures to manage and mitigate environmental harm and stakeholder disruption: elimination, substitution, reduce, engineering/isolation, administration and protective measures.

3.5.3 Demonstration of ALARP

In accordance with Spectrum's environmental impact and risk assessment matrix in

Table 3.4, the residual impact or risk is considered to be ALARP when it is evaluated as "Low". All other impact or risk rankings require consideration of additional controls to reduce them to ALARP (Table 3.5).

Table 3.5: Acceptability of residual risks and impacts and ALARP considerations

Residual risk ranking	Acceptability and ALARP considerations
Low	Acceptable. No impacts or those that are within normal bounds of variation. Good industry practice (including legislation and standards) has been applied. Acceptable and ALARP without further reduction measures being required.
Medium	Acceptable (tolerable), providing that it can be shown that all practicable control measures have been implemented, if the sacrifices are not grossly disproportionate to the environmental benefit gained, with continual review of these measures and any potential new ones. Deemed to be "as low as reasonably practical" (ALARP) and acceptable.
High	Undesirable, Spectrum management decision required to accept risks and proceed. Additional control measures are required to be considered and implemented, if the cost is not grossly disproportionate to the environmental benefit gained, to prevent or reduce the impact/risk to ALARP and an acceptable level.
Very high	Unacceptable (intolerable) and may require re-design of project and/or its parameters, additional control measures are required to be implemented (regardless of cost) to prevent or reduce the impact/risk to a lower level to be considered ALARP and acceptable.

Additional control measures considered in the ALARP demonstration have been assessed on their merits of impact/risk reduction and the proportionality of the sacrifice associated with each measure. This assessment considers the practicality, effectiveness, sacrifice and benefit of implementing the control measure.

Where the potential environmental, socio-economic or reputational benefit of a control clearly outweighed the sacrifice of implementation, the control was 'adopted'. Where the sacrifice of implementation was considered grossly disproportionate to the potential environmental, socio-economic or reputational benefit of a control, the control was 'rejected'. Further controls will be assessed as they are identified throughout the activity.

Residual impact and risk rankings following demonstration of ALARP were based on re-assessment of the consequence of the impact and the likelihood of that consequence occurring, with the adopted mitigating control measures in place using the matrix in Table 3.4.

3.5.4 Demonstration of acceptable levels of risk

- Spectrum's model for demonstrating acceptable levels of impacts and risks for the Otway Deep MSS is based upon the criteria described in Table 3.6. Using the appropriate criteria from Table 3.6, acceptable levels of impact were defined prior to conducting the evaluation of individual impacts and risks in Section 4 and Section 5. Not all the criteria for acceptance in Table 3.6 will apply to defining levels of acceptability for all impacts and risks. Spectrum has therefore distinguished between higher and lower order environmental impacts and risks.

- Higher order impacts/risks are generally more complex and include those where the environment or receptor affected is protected/threatened, vulnerable to the impact/risk, not widely distributed, or where there is uncertainty in the effectiveness of adopted control measures.

- Following demonstration that all reasonable and practicable control measures have been adopted to reduce the impacts and risks to ALARP, the pre-defined acceptable levels of impact have been compared with the residual levels of impact and risk. If the residual risk and impact levels lie within the boundaries of the pre-defined acceptable levels, the impact or risk is considered acceptable.

Table 3.6: Criteria for defining acceptable levels of impact

Criteria for acceptance	Definition of criteria
Spectrum's Internal Context	• Alignment with Spectrum's HSE Environment Policy and the environmental management system for the Otway Deep MSS • Spectrum impact/risk matrix defines 'low risk' as acceptable, 'medium risk' as acceptable providing ALARP has been demonstrated, 'high risk' as undesirable (i.e. requiring ALARP demonstration and decision to accept based on Spectrum management decision), and 'very high risk' as unacceptable (• Table 3.4).
Legislative Requirements	• Is the impact/risk being managed in accordance with existing Australian or international legislation, conventions and/or standards, • Aligned with the principles of Ecological Sustainable Development (ESD), including application of the precautionary principle and/or how uncertainty has been reduced. • Is the proposed management of the impact/risk aligned with species-specific or protected area management plans/conservation advice actions or conservation objectives? • Is the proposed management of the impact/risk aligned with the South-east Commonwealth Marine Reserves Network Management Plan (2013-2023) and Region Bioregional Plan?
Industry Good Practice	• Is the impact/risk being managed in accordance with industry good practice, and national and international standards?
Social Acceptance	• Concerns raised during stakeholder consultation have been assessed for their merits and control measures developed, if appropriate, to manage those concerns. • There are no outstanding merited concerns that have not been assessed.
Existing Environmental Context	• Is the effect on the environment or receptor localised, short-term and recoverable? • Is there the potential for population level or long-term effects? Are the adopted control measures appropriate and adequate in avoiding such effects?

3.6 Monitoring and review

Ongoing monitoring and review is essential to ensure the impact and risk assessments within this EP remain relevant. Introduction of new impacts/risks due to changes in the activity or context, changes in the consequence of impacts/risks, and maintaining effectiveness of adopted controls are addressed in Spectrum's Management of Change procedure

4 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

4.1 Impact 1: Underwater sound – seismic operations

4.1.1 Description of impact

The dominant source of underwater noise during the Otway Deep MSS will be from the operation of the seismic source (airgun array). The airgun array will have a maximum volume of 3,475 in3. Seismic data will be acquired in water depths of 170 to 3,600 m. Marine biota in the area of ensonification will be exposed to different levels of sound energy, depending on their behaviour, physiology and where they are in relation to the source.

Actual near-field and far-field received sound levels are influenced by a number of factors including the overall size (capacity) of the acoustic source, the array configuration, water depths in the area, position in the water column, distance from the source and geo-acoustic properties of the seabed.

The Otway Deep Activity EMBA encompasses the area that will be ensonified at levels expected to have an effect on marine biota – conservatively based on the cumulative sound exposure modelling for a 24 hour period, at the point closest to sensitive receptors and to the lowest of the biological threshold assessed (temporary effects on low frequency cetaceans).

Underwater received sound levels (RSLs) are not predicted to exceed the temporary threshold shift (TTS) threshold SEL24h value of 168 dB re1µPa2.s for cetaceans, beyond ~ 9 km inshore and along shore of the sail lines, and ~ 48 km offshore from the sail lines. The effect zone for ensonification is conservatively defined as the area extending 10 km inshore and along shore and 50 km offshore from the survey area. This area of ensonification is considered adequate because it encompasses all physiological and behavioural disturbance effects to all of the marine fauna considered, at the seabed and in the water column.

The areas of ensonification predicted by the underwater sound modelling for all marine biota considered, were based on the largest area of effect for all modelled locations; these areas are defined by the following distances from the source:

- Plankton – 7.2 km (inshore site, 170 m water depth) to 14.6 km (deep water site) from the source (based on mortality level recorded by Mccauley *et al.* 2017a)
- Crustaceans (e.g. Rock lobster, giant crab) – 175 m (inshore site, 170 m water depth) to 260 m from the source (based on sub-lethal effects recorded by Day *et al.* 2016)
- Bivalves (e.g. Scallops) – 175 m (Site 1 – closest to fishery) from the source (based on sub-lethal effects recorded by Day *et al.* 2016)
- Fish (demersal species, including site-attached species) – up to 3 km from the source (based on TTS effects for accumulated 24-hour exposure scenario)
- Fish (pelagic species) – up to 3 km from the source (based on TTS effects for accumulated 24-hour exposure scenario)
- Marine turtles – up to 4.3 km from the source (based on behavioural disturbance effects)
- Squid – up to 3.4 km from the source (based on behavioural disturbance effects)
- Low-frequency cetaceans (pygmy blue, southern right whales) – up to 10 km from the source in the inshore and along shore directions and 50 km in the offshore direction (based on TTS effects for accumulated 24-hour exposure)
- Low-frequency cetaceans (pygmy blue) – up to 9 km in all directions from the source (based on behavioural disturbance threshold splpk 160 db re1µpa)

- Low-frequency cetaceans (southern right whales cow/calves leaving the aggregation/calving BIA) – up to 15 km from the source (based on behavioural disturbance threshold splpk 140 db re1µpa)
- Mid-frequency cetaceans (sperm whales - *Physeter* sp.) – up to 9 km in all directions from the source (based on behavioural disturbance effects)
- High-frequency cetaceans (sperm whales - *Kogia* sp.) – up to 9 km in all directions from the source (based on behavioural disturbance effects)
- Pinnipeds (otariids, Australian fur seals) – up to 9 km in all directions from the source (based on behavioural disturbance effects)

4.1.2 Underwater sound modelling

Spectrum engaged JASCO Applied Sciences Pty Ltd (JASCO) to undertake underwater sound propagation modelling for the Otway Deep MSS to determine the potential spatial extent of potential underwater sound impacts (McPherson and Quijano 2018). Seismic sound was modelled by JASCO for a 3,475 in3 airgun array at a depth of 6 m below the surface within the survey area. The source level for the airgun array was calculated using JASCO's Airgun Array Source Model (AASM) which accounts for the array layout, the volume, tow depth and firing pressure of each gun, and any interactions between different airguns in the array (McPherson and Quijano 2018). The source level for the 3,475 in3 array is 255.1 dB re 1 µPa Lpk, which is the maximum instantaneous sound pressure level (SPL) or zero-to-peak SPL.

Per-pulse sound fields based on a single seismic shot were modelled at two standalone sites (Sites 1 and 2) and at nine sites along two possible seismic survey acquisition lines (sail lines). The single shot (per pulse) results for five of these sites (Sites 3, 6, 7, 8, and 11) are also presented in the impact assessment. Zero-to-peak pressure levels (Lpk) and peak-to-peak pressure levels (LPpk-pk) were also predicted for these sites. Seafloor sound levels were assessed at Site 1 as it was the closest operational point to the southern right whale BIA, Bonney Coast Upwelling KEF, VIC State-managed fishery boundaries and/or known areas of effort/catch (southern rock lobster), and Australian fur seal breeding colonies. All sites modelled, with the exception of Site 2, were located within the pygmy blue whale foraging and distribution/migrating BIAs. Site 1 was located within the southern right whale distribution/migration BIA and Sites 3, 4 and 7 located on the boundary of this BIA. These sites were considered by Spectrum and JASCO to be worst case locations for modelling and representative of the entire survey area.

The NOAA (2018) proposed dual criteria for the assessment of PTS and TTS to marine mammals, single shot (per-pulse) and cumulative exposure (suggested over a 24-hour period). Sail lines selected for the cumulative exposure scenario comprised approximately 24 hours of operation and were part of a potential acquisition pattern for Otway Central indicative survey area, which is the most likely area for data acquisition for the first survey season window as it is the most commercially important area. The survey lines were defined because they best represent the range of bathymetry along the continental shelf edge and continental slope that is relevant to BIAs for pygmy blue whales and southern right whales, as well as other key sensitivities in the region, including the West Tasmanian Canyons and Bonney Coast Upwelling KEFs. The per-pulse sound field from Site 1 was assessed at five locations of sensitivity for marine fauna receptors. The sites included in the cumulative exposure scenario were considered representative of the seabed type and bathymetric features across the full extent of the Otway Deep survey area (McPherson and Quijano 2018).

4.1.2.1 Conservatism in model assumptions

Due to uncertainties often existing in terms of site-specific knowledge of physical oceanographic conditions and/or seabed type and composition, the site-specific geoacoustic parameters for the sites modelled in the Otway Deep MSS survey area (e.g. seabed substrate type, sea surface roughness) demonstrate the conservatism that has been built into JASCO's modelled received levels.

JASCO reported two distances relative to the source are reported for each sound level: Rmax, the maximum range to the given sound level over all azimuths, R95%, the range to the given sound level after the 5% farthest points were excluded. The difference between Rmax and R95% depends on the source directivity and the non-uniformity of the acoustic environment.

4.1.2.2 Marine fauna exposure criteria adopted

The threshold values comprise the range of sound levels which may have different effects (injury / physiological damage through to behavioural disturbance leading to avoidance of the area) on the range of receptors in the area to be ensonified.

4.1.2.2.1 Plankton, fish larvae and eggs

In selecting impact thresholds, the EP considers a variety of different studies which have investigated the effects of underwater sound on plankton, including the eggs and larvae of finfish and invertebrates. Guideline thresholds for mortality to eggs and larvae have been proposed based on the sound exposure guidelines by the ANSI-Accredited Standards Committee S3/SC 1, Animal Bioacoustics Working Group (Popper et al. 2014). The criteria that Popper et al. (2014) suggest for mortality in eggs and larvae is 207 dB re 1 µPa Lpk and is based on levels measured in the study by Bolle et al. (2012) that indicated no damage was caused by simulated repeated pile driving signals. This level has been used for the assessment of underwater sound from seismic on plankton including fish larvae and eggs.

4.1.2.2.2 Invertebrates

There are no peer reviewed and/or recognised sound exposure guidelines/criteria for invertebrate species.

Day et al. (2016) assessed the impact of seismic sound on rock lobsters, scallops and their larvae. Exposure to the maximum measured SPL of 209 to 212 dB re 1µPa (Lpk-pk) did not result in mortality of any adult lobsters or a reduction in the quantity or quality of larvae; however, a range of sub-lethal effects to adults were observed (Day et al. 2016). For the assessment of potential effects on crustacean species (southern rock lobster and giant crab) from the Otway Deep MSS, an SPL of 209 dB re 1µPa (Lpk-pk) has been adopted as the exposure level for which a range of effects may be experienced ranging from sub-lethal to behavioural or catchability effects. Exposure to air gun signals did not result in any lobster mortality in any of the experiments conducted in the Day et al. (2016) study; therefore, mortality is not expected to occur based on these findings.

There have been no observed cephalopod mortalities directly associated with seismic surveys. Studies exposing cephalopods to near-field low-frequency sound have shown received levels may cause anatomical damage, but research is limited (Carroll et al. 2017). Hence, no thresholds/criteria or comparable levels are proposed to assess the potential for mortality or physical injury in squid as a result of the Otway Deep MSS.

McCauley et al. (2000) described behavioural responses of squid (Sepioteuthis australis) following exposure to sound from seismic surveys. Squid were observed jetting away from the direction of the airgun and ejecting ink (alarm response) at a sound exposure level (SEL) of 162 dB re 1µPa2s. For the assessment of potential effects on squid from the Otway Deep MSS, a behavioural disturbance received level of 162 dB re 1µPa2.s has been adopted, which is comparable to the level elicited strong avoidance and alarm responses.

4.1.2.2.3 Fish

The thresholds for harm to fish species have been based on the sound exposure guidelines for fish proposed by the ANSI-Accredited Standards Committee S3/SC 1, Animal Bioacoustics Working Group (Popper et al. 2014) as shown in Table 4.1: .

Table 4.1: Summary of fish injury exposure guidelines for seismic airguns (Popper et al. 2014)

Type of fish	Mortality and potential mortal injury (dB re1 µpa)	Impairment (dB re1 upa)	
		Recoverable injury	TTS*
Fish: no swim bladder (particle motion detection)	>213 dB peak	>213 dB peak	>186 dB SEL_{cum}
Fish: swim bladder is not involved in hearing (particle motion detection)	>207 dB peak	>207 dB peak	>186 dB SEL_{cum}
Fish: swim bladder involved in hearing (primarily pressure detection)	>207 dB peak	>207 dB peak	186 dB SEL_{cum}

*TTS – short or long-term changes in hearing sensitivity that may or may not reduce fitness (defined as any persistent change in hearing of 6 db or greater).

The guideline levels for each of the criteria above have been derived from a number of sources. The mortality and recoverable injury guidelines are based on predictions derived from effects of impulsive sounds from piling (Halvorsen et al. 2011), since there are no quantified data for seismic airguns. Popper et al. (2014) acknowledge that there are few data regarding the effects of seismic airgun noise on fish mortality and damage to organ systems, and that studies of fish with swim bladders have not shown mortality to date (Popper et al. 2007; Hastings et al. 2008; and McCauley and Kent 2012). In the absence of such data, the guidelines for “mortality and potential mortality” and for “recoverable injury” have been extrapolated from piling studies and are therefore typically conservative and precautionary in nature (Halvorsen et al. 2011; and Popper et al. 2014).

Both cumulative SEL and peak SPL guidelines have been proposed, however the Working Group states that the direct application of cumulative criteria adopted for piling driving to seismic airguns would not be appropriate. This is because the received peak SEL (or “single strike” SEL) changes from shot to shot since the seismic vessel is moving and will be at different distances from the fish. Note that for piling, it is possible to determine the cumulative noise exposure as piling is a stationary noise source. Therefore, the Working Group conclude that it is better to use a guideline based on the closest peak level for seismic airguns than one based on a cumulative exposure (Popper et al. 2014).

The tentative thresholds proposed by Popper et al. (2014) are extremely conservative as they use the “recoverable injury” sound level as a “mortality and potential mortality” threshold in the absence of data on mortality levels. The potential mortality level was based on the ‘lowest level where injury was found’ in a study of fish exposed to piling noise. Halvorsen et al. (2011, 2012) measured the ‘response weighted index (RWI)’ of Chinook salmon exposed to pile driving. From this study, the authors identified that an RWI of 2 would be an acceptable level of physiological injury for the fish species exposed to pile driving, with a peak SPL level of 207 dB re 1 µPa. It should be noted that the RWI ranking of 2 relates to two ‘mild’ and ‘non-life threatening’ injuries.

Casper et al. (2012) further investigated the RWI for several fish species representative of the three fish groups identified by Popper et al. (2014), i.e. Group1: fish without swim bladders (sharks, rays, flatfish (e.g. hogchoker)), Group 2: fish with swim bladders not involved in hearing (salmonids, sturgeons, jewfish, snapper) and Group 3: fish with swim bladders involved in hearing and structurally connected to the inner ear, (herring, perch, bass, rockfish). The study did not identify any mortal or potentially mortal injuries in the four fish species studied exposed to piling noise levels above an SEL of 177 dB re 1 µPa2.s (or 207 dB re 1 µPa SPL peak). This level was concluded by the authors as being the potential onset of physiologically significant injuries (Casper et al. 2012).

In the absence of data specific to quantification of the effects on fish from seismic sources, the guidelines for “mortality and potential mortality” and for “recoverable injury” have been extrapolated from these piling studies and are, therefore, highly conservative and precautionary in nature (Halvorsen et al. 2011, 2012; Casper et al. 2012; Popper et al. 2014). It is, however, important to note that the intent of authors in proposing these guidelines was as “a first step in setting guidelines that may lead to the establishment of exposure standards for fish (and sea turtles)” (Popper et al. 2014).

The actual impacts associated with noise levels at the tentative threshold proposed by Popper et al. (2014) are unknown, but they represent the level at which physiological damage may start to occur. They do not represent a likely mortal impact zone and empirical field data indicates mortality will not occur at these levels.

The guideline levels for TTS for fish are based on data from Popper et al. (2005, 2014) for exposure of fish to a seismic airgun array. The fish were exposed to a noise level of 186 dB re 1µPa2.s (SELcum), accumulated over five seismic pulses, and provide the most relevant cumulative exposure guideline specific to a seismic study. In the Popper et al. (2005) study, the experimental design was based on five exposures to the airgun at 40 second intervals so that the fish were exposed to a steady sound level. The authors note that in contrast, a normal seismic survey might present signals as often as every 10 seconds; however several contributing factors are described in the paper that lead the study authors to conclude that, although these factors do not compensate for the more frequent exposure in an actual seismic survey, their experiments exposed fish with an approximate ‘‘worst case’’ with regard to seismic stimulation (Popper et al. 2005). These factors include that as the survey vessel is moving, a stationary fish subject would be exposed to the maximum level only once in a sequence of exposures. Further, that the majority of exposed fishes during a seismic survey are likely to be at greater distances from the source than those in the Popper et al. (2005) study (i.e. 13 and 17 m) and would therefore receive a lower sound level. The guideline level for TTS

proposed by Popper et al. (2014) derived from the results of the experiments conducted by Popper et al. (2005) are based on TTS responses from a hearing specialist fish species (i.e. those with the highest sensitivity to sound). This guideline level can also be considered worst case in this respect for the fish species assessed within this EP.

There is no peer reviewed published threshold for comparison of behavioural disturbance effects in fish as a result of exposure to seismic sound. In the absence of a threshold, the level at which the onset of TTS may occur is considered an appropriate threshold for the assessment of potential effects for the Otway Deep EP. An independent peer review conducted by Popper (2018) for the Bethany MSS EP concluded that the most likely effect on fish in the acquisition area is TTS. Popper (2018) highlighted that if TTS is experienced, the level would be low, and recovery would start as soon as the most intense sound ends and would be within 24 hours. Popper (2018) further explains that the effects of TTS are unlikely to show up in fishes until the intensity of the sound is well above the fish's hearing threshold. For fish species that are free swimming (which include key commercially targeted species) it is likely that there would be no TTS effect whatsoever since fish will likely move away from the sound source. Based on the review by Popper (2018), the 24-hour period selected to assess SELcum and any associated effects is likely to be highly conservative for assessing the potential effects to fish (including those of commercial value). This is further supported in NOPSEMA's Statement of Reasons for acceptance of the Bethany EP.

Spectrum has also adopted cumulative SEL as the TTS threshold for exposure in fish and which based on the above expert review is deemed to be conservative, and that any TTS effects in fish will be temporary and likely to recover within 24 hours.

4.1.2.2.4 Marine turtles

Popper et al. (2014) proposed a guideline for mortality and potential mortal injury for marine turtles of 207 dB re 1 µPa based upon piling studies. There have been no studies conducted on hearing loss or the effects of exposure to intense sounds on hearing in any turtles, therefore Popper et al. (2014) have extrapolated from fish, based on the rationale that the hearing range for turtles much more approximates to that of fishes than of any marine mammal.

There are no specific guideline values proposed by the Working Group for behaviour due to the limitations described above (Popper et al. 2014). Therefore, the assessment of the potential effects on behaviour for marine turtles in this EP is based on an avoidance response of 166 dB re 1 µPa from a study conducted by McCauley et al. (2000).

4.1.2.2.5 Cetaceans

Based on current knowledge of functional hearing in marine mammals, NOAA (2016) identify three distinct, functional groups of cetaceans, based on the frequency range at which their hearing is most sensitive: a) low frequency (LF) cetaceans (7 hertz – 35 kilohertz); b) mid-frequency (MF) cetaceans (150 hertz – 160 kilohertz); c) high frequency (HF) cetaceans (275 hertz to 160 kilohertz).

NOAA (2016) recommend dual marine mammal criteria for the prediction of PTS and TTS from underwater sound modelling – peak SPL 'unweighted' criteria and cumulative exposure weighted criteria. Spectrum have applied both sets of criteria in the assessment for marine mammals within this EP.

NOAA's (2016) revised acoustic thresholds did not suggest a revised approach to Southall et al.'s (2007) suggested criteria for behavioural disturbance. The US National Marine Fisheries Service (NMFS) (2013) sound level criterion for potential disturbance to marine mammals (pinnipeds and cetaceans) is 160 dB re 1 µPa SPL for impulsive sounds, which is peer reviewed and accepted by the scientific community, and has therefore used for the assessments in this EP.

In recognition of the likely greater sensitivity of southern right whale aggregation/calving BIA off Portland/Warrnambool and the temporal overlap with the Otway Deep survey (i.e. October); a more precautionary behavioural disturbance threshold has been applied for cow/calve pairs that may leave the BIA during October. Southall et al. (2007) proposed a severity scaling for behavioural disturbance effects and reported that onset of significant behavioural disturbance from multiple pulses (i.e. seismic) occurring at received levels of 140 to 160 dB re 1 µPa SPL for low-frequency cetaceans. This lower threshold of 140 dB re 1 µPa SPL has been applied for the evaluation of potential impacts to southern right whales cow/calf pairs associated with the BIA.

In addition, EPBC Act Policy Statement 2.1 determines suitable exclusion zones with an unweighted single shot SEL threshold of 160 dB re 1 µPa2·s (DEWHA 2008). The policy statement is only relevant for baleen and large toothed whales and does not apply to smaller dolphins and porpoises (DEWHA 2008). This threshold has also been applied to the assessment in this EP.

Table 4.2: Summary of injury and behavioural criteria for marine mammals

Marine Mammal Hearing Group	DEWHA (2006)	Southall et al. (2007)	NMFS (2013)	NMFS (2016)			
	Unweighted per-pulse SEL (dB re 1 uPa2-s)	Behaviour (southern right whale cow/calves	Behaviour (all other marine mammals)	Injury (PTS)		TTS	
		SPL (dB re uPa)	SPL (dB re uPa)	Weighted SEL2 (dB re 1 uPa2-s)	PK (dB re 1 uPa)	Weighted SEL24h (dB re 1 uPa2-s)	PK (dB re 1 uPa)
Low frequency cetaceans	160	140	160	183	219	168	213
Mid-frequency cetaceans				185	230	170	224
High- frequency cetaceans				155	202	140	196
Phocid pinnipeds in water	NA			185	218	170	212
Otariid pinnipeds in water	NA			203	232	188	226

4.1.3 Predicted impacts from the Otway deep MSS

4.1.3.1 Impacts to plankton (incl. fish larvae and eggs)

Planktonic organisms are transported by prevailing wind- and tide-driven currents; becoming very widely dispersed and they cannot take effective evasive behaviour to avoid seismic sources. Some forms of phytoplankton and zooplankton can migrate vertically in the water column, but their horizontal position is largely determined by water movement and currents. Zooplankton typically exhibit diel vertical migration whereby they migrate to the water surface at night and return to deeper waters during the day. Certain species (e.g. the copepod Neocalanus plumchrus) will also migrate to different depths at different stages of their life cycle (Kobari and Ikeda 2001). Phytoplankton, particularly diatoms and dinoflagellates, also show diel vertical migration (e.g. Cullen and Horrigan 1981, Hajdu et al. 2007), triggered by environmental conditions such as irradiance in the photosynthetically active radiation range (400 to 700 nm wavelengths) (Gerbersdorf and Schubert 2011).

Spatially, phytoplankton will vary according to nutrient concentrations and light availability. Temporally, phytoplankton populations in subtropical oceans drop off in summer as the buoyant warmer water becomes nutrient depleted. Zooplankton growth rates are highly variable among species. Spatially, the abundance and diversity of zooplankton varies significantly at all scales, driven by environmental conditions such as water temperature, depth, season, the availability of food resources and predation.

In general, there have been few studies into the effects of marine seismic surveys on plankton. Up until recently, studies on the effects of noise from airguns on plankton have indicated that any effect is likely to be highly localised (<10 m from the source and typically within 0.5 to 5 m) (Table 4.3:) (Kostyuchenko 1973; Matishov 1992; Booman et al. 1996; Payne 2009). These studies indicated that impacts would be insignificant compared with the naturally high turnover rates of zooplankton

Table 4.3: Observed seismic noise pathological effects on zooplankton

Species	Source	Source level (dB re 1 µpa)	Distance from source	Exposure level (db re 1 µpa SPL)	Observed effect	Source
Cod (larvae 5 days)	Single airgun	250	1 m	250	Delamination of the retina	Matishov (1992)
Cod (larvae 2–10 days)	Single airgun	222	1 m	222	No injuries detected	Dalen and Knutsen (1987)
			10 m	202	No injuries detected	
Fish eggs (anchovy)	Single airgun	230 (estimated)	1 m	230	7.8% of eggs injured relative to control	Kostyvchenko (1973)
			10 m	210	No injuries detected	
Fish eggs (red mullet)			1 m	230	No injuries detected	
			10 m	210	No injuries detected	
Dungeness crab (larvae)	Seven airgun array	244 (estimated)	1 m	233.5	No significant difference in survival rate relative to controls	Pearson et al. (1992)
			3 m	230.9		
			10 m	222.5		
Snow crab (eggs)	Single airgun	216	2 m	216	1.6% mortality; 26% delay in development	Christian et al. 2004
Spiny lobsters (embryos)	Single airgun	223 (estimated)	Run over the pots	200	No differences in the quantity or quality of hatched larvae	Day et al (2016)
		224 (estimated)		203		
		227 (estimated)		205		
Zooplankton (incl. krill)	Single airgun (150 cui)	205 (estimated)	1.2 km	178 (SPL) (153 dB re 1 µPa	Decreased abundance and increased mortality rate from 19% to 45%	McCauley et al. (2017)

Day et al. (2016) exposed egg-bearing female spiny lobsters (Jasus edwardsii) to noise from three air gun configurations, all of which exceeded levels of 209 dB re 1 µPa (Lpk-pk). Overall there were no differences in the quantity or quality of hatched larvae, indicating that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure. Although no apparent morphological abnormalities were observed, exposed larvae from the 45 in3 experiment were found to be significantly longer than control larvae. However, the size of larvae in this study fell well within the range of natural variation, indicating natural variation in larvae is much greater that the differences observed between treatments in this study. Day et al. (2016) concluded no effects on embryos early in development within 1 to 1.5 km of the seismic source.

CSIRO modelled the impacts on zooplankton from a 35-day seismic survey in 300 to 800 m deep water in an 80 km x 36 km survey area (Richardson et al. 2017). Within the survey area, the model predicted a 22% reduction in zooplankton biomass, which declined to 14% within 15 km of the survey area. They modelled the recovery of the plankton population and found it returned to 95% of the original biomass level within three days after the end of the survey. The rapid recovery was attributed to the fast growth rates of zooplankton and the dispersal and mixing of zooplankton from inside and outside the impacted area (Richardson et al. 2017). The Bonney Coast is an area of known high primary productivity during periods of upwelling, however it lies 24.5 km from the survey area at its closest point and is therefore outside of the predicted area of ensonification for effects on plankton from seismic sound.

The potential impacts of the Otway Deep MSS on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the airgun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to diel migration of plankton (including fish larvae) between surface and deep waters. Consequently, predicting impacts is difficult due not only to the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey.

Although the recent work by McCauley et al. (2017) and Richardson et al. (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability.

Based on the underwater sound modelling for the Otway Deep MSS, the predicted ensonified area within which received sound levels exceed Popper et al.'s (2014) mortality or mortal injury threshold for fish eggs and larvae is restricted to a distance of 110 m from the source through the water column and 166 m from the source at the seabed. In consideration of the spatial and temporal extent of this predicted impact it is also important to consider the following:

- Any plankton, including fish eggs and larvae, present in the water column within the survey area will not be evenly distributed, and are likely to exhibit substantial spatial patchiness and will be moving with the currents in the area;

- The seismic source will be constantly moving, and plankton populations are constantly being replenished by currents from non-impacted areas. Plankton populations' recover quickly due to their fast growth rates, and the dispersal and mixing of plankton from both inside and outside of the impacted area.

- Any mortality or mortal injury effects to fish eggs and larvae resulting from seismic noise emissions are likely to be inconsequential compared to natural mortality rates of fish eggs and larvae, which are very high (exceeding 50% per day in some species and commonly exceeding 10% per day). For example, in a review of mortality estimates (Houde and Zastrow 1993), the mean mortality rate for marine fish larvae was M = 0.24, a rate equivalent to a loss of 21.3% per day.

From this assessment, predicted impacts are localised (within the 110-166 m from the source), and short-term based on estimated recovery times (days). These potential impacts are not significant when compared to rates of natural mortality in planktonic populations (10 – 50% per day), and impacts are not expected at a regional scale, based on the survey area plus 166 m buffer comprising 0.56% of the South-east Marine Bioregion.

4.1.3.1.1 Impacts to spawning

Key target species for commercial fisheries that overlap the Activity and Oil Spill EMBAs are described in Section 2. It is possible that some of these species could spawn in the Activity EMBA at the time of the survey as summarised in Table 4.4. The ensonified area of effect is based on predicted received sound levels compared with the Popper et al. (2014) reported level for mortality in fish eggs and larvae (207 dB re 1 µPa Lpk). Fish larvae and eggs could be affected up to 110 m from the source in all water depths modelled (i.e. 175 to 2,756 m) and up to 166 m from the source at the seabed in shallow waters in water depths for southern rock lobster and giant crab.

The potential mortality of larval fish that rely on zooplankton for food is difficult to predict but is not expected to affect a significant proportion of larvae based on the assumptions that not all zooplankton are killed by exposure to airguns (Richardson et al. 2017) and only a very small proportion of the plankton would be exposed at any one time. Furthermore, zooplankton populations are likely to recover rapidly following completion of a seismic survey due to fast growth rates and mixing of zooplankton from both within and without the area of effect.

Richardson et al. (2017) showed that zooplankton communities can begin to recover during the survey period during periods of good oceanic circulation (and periods of upwelling). Hence, a continuous decline in zooplankton throughout the survey period is not anticipated, and parts of the survey area would progressively recover as the survey proceeded. It is unlikely therefore that localised patches of reduced food availability for plankton feeders would occur over the period of the survey and during the 3-day recovery period (as modelled by Richardson et al. (2017)). No population level effects are therefore expected in commercially caught species, or to their catch rates as an indirect result of impacts on eggs/larvae.

Table 4.4: Fish species potentially spawning in ensonified area of effect for plankton

Fish species	Spawning activity / species biological depth range	Impacted by survey
Blue grenadier	• Spawns May to Oct (200-700 m depth) • Main spawning areas located off the central west coast of mainland TAS (Gunn et al. 1989b) and eastern VIC/southern NSW (Bruce et al. 2001).	Unlikely - main spawning areas outside of survey and Operational Areas and overlap of spawning limited to one month at end of spawning period
Tiger flathead	• Spawns spring to autumn (10-400 m depth) • Mature fish migrate to shallow continental shelf waters (<200 m depth) prior to the spawning period (AFMA 2017)	Unlikely – survey overlaps only a small area in the shallowest parts (<200 m) where spawning occurs. Spawning period is also protracted
Silver warehou	• Spawns Jul to Oct close to the seabed (27-650 m depth) • Major spawning areas are located off the west coast of mainland TAS	Unlikely - main spawning areas outside of survey and Operational Areas and overlap of spawning limited to one month at end of spawning season
Pink ling	• Spawns multiple times Mar to Oct (40-700 m depth) • Mature fish migrate to shallow continental shelf waters (<200 m depth) prior to the spawning period (CSIRO 2002)	Unlikely - main spawning areas outside of survey and Operational Areas and overlap of spawning limited to one month at end of spawning season; vessel expected to be outside of this area by the time this species spawns due to operations commencing inshore and moving offshore
Blue-eye trevalla	• Spawns Feb to Jul (40-1,500 m depth) • Moves into shallower depths (320–400 m) and form spawning aggregations over rough ground and drop-offs on the continental slope, as well as over seamounts (Kailola et al., 1993). • Spawning is widespread across the South-east Marine Region (CSIRO, 2002) although most spawning activity occurs in waters from central NSW to north-eastern TAS (AFMA, 2017)	Unlikely – survey area overlap is ~1 month, however vessel expected to be outside of spawning areas by the time this species spawns in February due to operations commencing inshore and moving offshore; spawning is widespread across region
Jack mackerel	• Spawns multiple times Dec to Feb (10-460 m depth) • Spawning occurs near the edge of the continental shelf with eggs and sperm released among schooling fish deep in the water column (CSIRO, 2002). • Larvae are thought to be carried inshore by currents (Marshall et al. 1993)	Unlikely – multiple spawner over areas in <200 m largely outside of survey/Operational Area.
Redbait	• Spawns multiple times Aug to Nov (86-500 m depth) • Spawns on outer continental shelf, mostly at night, once every three to five days over the spawning period	Unlikely – multiple spawner over areas in <200 m largely outside of survey/Operational Area.
Australian sardine	• Spawns multiple times Sept to Apr (0-200 m depth) • spawns on continental shelf (200 m) with larvae moving Inshore towards bays and inlets during a planktonic period of around 120 days after hatching	Unlikely – multiple spawner over areas in <200 m largely outside of survey/Operational Area.
Gould's squid	• Spawns continuously throughout the year (0-700 m depth)	Unlikely – multiple spawner over areas in <200 m largely outside of survey/Operational Area.
Southern rock lobster	• Mates April to June and hatches September to November • larval stages spend from 9–24 months at sea and Become widely distributed before metamorphosing to post-larval puerulus, which swim towards the coast and settle • Larval settlement highest during winter with peak settlement observed in August in each VIC/SA/TAS. A second, less prominent settlement peak can sometimes occur in December/January in TAS and VIC (Hobday et al 2006).	Unlikely to impact spawning adults – survey planned outside of spawning season; spawning outside majority of survey area (<200 m depth); peak larval settlement outside of survey timeframe. Unlikely to impact to adults releasing eggs – 4 days of acquisition in waters <200 m depth spread over 50 days acquisition duration (for Central Area only). Negligible impact to larvae – planktonic stage up to 24 months, no impacts to embryonic lobster larvae (Day et al. 2016) outside of natural variation.

Fish species	Spawning activity / species biological depth range	Impacted by survey
Giant crab	• Spawns May to Jul (peak in June) and hatches Oct to Nov (peak in October; Levings 2008) • Release of young (hatching) occurs in shallower depths of the continental shelf break (< 200 m water depth; Kailola et al. 1993; Harris et. al 2003) • Larval stage may last up to 2 months	Unlikely to impact spawning adults – survey planned outside of spawning season; majority of survey area is >400 m water depth Unlikely to impact to adults releasing young – 6 days of acquisition in waters <400 m depth spread over 50 days acquisition duration (for Central Area only). Negligible impact to larvae – planktonic stage up to 2 months, no reported impacts to crab larvae (e.g. Pearson et al. 1994) outside of natural variation.
Australasian snapper	• Spawns Dec to Jan (VIC) and November to Dec (SA) with planktonic phase Jan to Apr (0-200 m depth) • Spawning generally occurs in waters less than 50 m deep (Kailola et al. 1993). • Eggs and larvae are planktonic for an extended period but remain nearshore	Unlikely - spawning areas (<200 m depth) largely outside of survey and Operational Areas; vessel expected to be outside of this area by the time this species spawns due to operations commencing inshore (shallowest depth 175 m) and moving offshore
King George whiting	• Spawns May to Jul with planktonic phase Aug to Nov (2-200 m depth) • Spawning aggregations form around reefs in SA continental shelf waters up to a depth of 50 m (Jenkins et al. 2000). • Spawning is not known to occur in VIC or TAS waters (Hamer et al. 2004).	No impact – survey planned outside of spawning season; no spawning in VIC/TAS waters; planktonic phase in SA up to ~50 m and outside of survey and Operational Areas

4.1.3.2 Impacts to invertebrates and fisheries

Consultation with stakeholders has identified considerable concerns over the impacts of seismic activities on commercial fisheries. As indicated in Appendix A and Industry reports provided by Seafood Industry Victoria (SIV) and the Tasmanian Seafood Industry Council (TSIC), many concerns are general in nature. Where specific concerns are described those that are seismic-related can be summarised as (1) impacts to adults – impacts on catches due to behavioural changes or mortality/injury affecting catchability and reproduction, and (2) impacts to planktonic larvae – resulting in a loss of food for adults of commercial species, and loss of recruits to populations of commercial species.

Until recently, effects on marine invertebrates were expected to be limited in spatial extent (<10 m as reported in a study of the effect of seismic explosions on pearl oysters by Le Provost et al. (1986)), as they are considered less sensitive to noise than hearing-specialist fish species, due to the lack of air-filled organs. La Bella et al. (1996) examined biochemical indicators of stress in bivalves exposed to seismic airgun noise. In this study, they found that hydrocortisone, glucose and lactate levels between test and control animals were significantly different in the venerid clam Paphia aurea, showing an evidence of stress caused by acoustic noise. This was measured at an exposure distance of 7.5 m. Following on from this a study by Hirst and Rodhouse (2000) suggested that most invertebrates would only detect seismic shots within about 20 m, and that catch levels of shrimp and lobster in areas surveyed with airguns reported no change during the surveys (Hirst and Rodhouse 2000). A study conducted in 2002 examined a number of health, behavioural, and reproductive variables before, during, and after, seismic shooting on snow crabs (Chionoecetes opilio). Experimental animals were exposed to peak received broadband sound levels of 201 to 237 dB re 1 µPa. The results of the study suggested no obvious effects on crab behaviour, health or catch rates (Christian et al. 2004).

A study conducted by the Tasmanian Aquaculture and Fisheries Institute (TAFI) assessed the immediate impact of seismic surveys on adult commercial scallops (P. fumatus) in the Bass Strait in 2010 (Harrington et al. 2010). Participants in the Bass Strait Central Zone Scallop Fishery (BSCZSF) were concerned that the seismic survey may have a negative impact on the commercially important adult scallops within the region. The TAFI study concluded that no short-term (<2 months) impacts on the survival or health of adult commercial scallops were detected after the seismic survey (Harrington et al. 2010). There had been no

change in the abundance of live scallops (or related change in dead scallop categories) or macroscopic gonad and meat condition after seismic surveying within either the control, impacted or semi-impacted strata. There was also no observable change in the size frequency distribution of scallops in the impacted and semi-impacted strata following the survey.

In response to the lack of discernible results from the 2010 before and after study by TAFI discussed above and the concerns from fisheries groups that seismic operations negatively affect catch rates, the Gippsland Marine Environmental Monitoring (GMEM) project was developed (Przeslawski et al. 2016). This study aimed at modelling and measuring sound at various depths before and during a seismic survey in 2015 to quantify potential impacts of seismic surveys on scallops and other benthic organisms. The underwater sound model predicted SELs of 170 dB re 1µPa2.s within 250 m of the source and sound levels exceeding 150 dB re 1µPa2.s out to 4 km from the source. However, the highest SEL measured by hydrophones during the survey was 146 dB re 1µPa2.s at 51 m depth when the airguns were operating 1.4 km away. As such, the model was shown to be highly conservative, with actual noise levels falling to under 150 dB re 1µPa2.s much closer to the seismic source than predicted. There was no evidence of increased scallop mortality, or effects on scallop shell size, adductor muscle diameter, gonad size, or gonad stage due to the seismic sound (Przeslawski et al. 2016). The authors concluded that the GMEM study provided no clear evidence of adverse effects on scallops, fish, or commercial catch rates due to the 2015 seismic survey undertaken in the Gippsland Basin. Przeslawski et al. (2016) further concluded that the GMEM study provides a robust and evidence-based assessment of the potential effects of a seismic survey on some fish and scallops.

The Day et al. (2016) study is the most recent that has recorded negative effects on commercially important shellfish species from seismic sound. The study investigated the effects of seismic sound on southern rock lobsters (Jasus edwardsii) and the Australian scallops (Pecten fumatus). Rock lobster experiments consisted of four sampling times between days 0 and 120 post-exposure, as well as over the longer term of 365 days post-exposure. Each lobster experiment comprised two treatments; a control pass of the airgun where it was deployed but not operated, and an active pass of the airgun (Day et al. 2016). Following exposure, a total of 302 lobsters, were sampled and assessed for mortality, two behavioural reflex tests, statocyst damage (balance and gravity sensing organ), condition, haemolymph biochemistry, the number of circulating haemocytes and embryonic development. The maximum measured exposures were 209 to 212 dB re 1 µPa Lpk-pk. The maximum cumulative SEL received from multiple shots was between 192 and 199 dB re 1 µPa2.s (Day et al. 2016). The study found that exposure to seismic sound levels up to a maximum SEL of 209 to 212 dB re 1 µPa Lpk-pk did not result in mortality of any adult lobsters, even at close proximity. However, sub-lethal effects, relating to impairment of reflexes, damage to the statocysts and reduction in numbers of haemocytes (possibly indicative of decreased immune response function), were observed after exposure (Day et al. 2016a).

Although, the Day et al. (2016) study did not investigate the ecological impacts of the sub-lethal effects, of note however, is that the lobsters used for the July 2014 standard pressure experiment were collected from a scientific reserve in an area of high ambient levels of anthropogenic noise. These animals were found to have a high level of pre-existing damage to statocysts similar to that induced by the airgun experiments. These lobsters when exposed to the seismic airgun did not exhibit a significant increase in statocyst damage. The study authors suggested that this indicated that lobsters can adapt to statocyst damage, as these control lobsters with damaged statocysts did not display impaired righting reflexes.

Scallop experiments comprised four treatments, a control pass of the airgun deployed but not operated, one pass of the airgun, two passes of the airgun or four passes of the airgun. Seismic sound exposure did not cause mass mortality of scallops during the experiment; however, repeated exposure (i.e. more than one pass of the airgun) where maximum exposure levels were in the range of 212 to 213 dB re 1µPa peak-peak SPL was considered to possibly increase the risk of mortality (Day et al. 2016). Scallops exposed to repeated seismic sound suffered physiological damage with no signs of recovery over the four-month period; suggesting potentially reduced tolerance to subsequent stressors. In addition, changes in behaviour and reflexes during and following seismic exposure were observed. Day et al. (2016). Day et al. (2016) concluded that the results of their study were broadly applicable to spiny lobster and scallop fisheries throughout the world and crustaceans and bivalves in general.

Commercial scallops are mainly found at depths of 10-20 m but may also occur down to 60 m, which is shallower than the water depths of the Otway Deep MSS (175 to 3,600 m). Therefore, commercially fish scallops and wild stock scallops will not be affected by the survey due to spatial separation and do not require further assessment in this EP.

Morris et al. (2018) investigated the effects of seismic on the snow crab fishery along the continental slope in Canada in a before and after control impact (BACI) study over a period of two years. Crabs were exposed to received levels of 187 dB re 1µPa2.s (single shot) and 200 dB re 1µPa2.s (cumulative over 24 hours). There was no negative effects on the catch rates in the shorter term (days) or longer term (weeks), and the authors concluded that seismic effects on snow crab harvest (if they do exist) would be smaller than changes related to natural spatial and temporal variation.

The relevance and implications of the above research has therefore been considered in the context of southern rock lobster and giant crab fisheries and stocks in the Otway Deep MSS Activity EMBA.

4.1.3.2.1 Southern rock lobster

Southern rock lobster are broadly distributed across southern Australia in depths of 1 to 200 m. Across their range they are considered a single biological stock due to the broad spatial and temporal range of larvae. Mating occurs in autumn/winter, with eggs held by the (berried) female until release between September and November. The planktonic phyllosoma stage goes through eleven developmental stages that are widely dispersed and can be found hundreds of kilometres offshore during a protracted developmental stage lasting up to 20 months (Bradford et al. 2015). Dispersal of larval southern rock lobster along southern Australia is predominantly in an easterly direction due to the Leeuwin Current, highlighting the importance of western areas as larval sources (Bruce et al. 2007). The subsequent settlement (puerulus) stage swims inshore to settle onto reef habitats in depths shallower than 50 m. Adults may not move far once they settle, and movement into deeper waters is slow (less than a kilometre per year in most areas; PIRSA 2013).

Impacts of the proposed survey on pelagic and benthic life history stages of southern rock lobster are therefore expected to be minor. For benthic adults they will be limited to small areas of the Central Acquisition Area in VIC waters where depths are less than the maximum depth limit of 200 m for this species (noting that seismic activities in SA and TAS waters will occur in depths greater than 200 m). Underwater sound modelling was carried out for the Otway Deep MSS for an airgun array source level of 3,475 in3. Received levels were predicted at the seabed for single shot (per-pulse) and compared with the maximum received level (209 dB re 1 µPa) recorded by Day et al. (2016a) that resulted in sub-lethal effects in lobsters. Sound modelling results for the Otway Deep MSS predicts potential for sub-lethal effects (no mortality) in lobsters between 175 and 260 m from the seismic source. These predicted distances are consistent with the distances measured by Day et al. (2016) (i.e. sub-lethal effects up to 166 to 232 m from the seismic source).

The area of rock lobster habitat (<200 m depth) that may be exposed to sound levels above the 209 dB threshold is 122.2 km2 (or 0.8% of the Western Zone Warrnambool Region of the VIC rock lobster fishery. This area is located within the Central Acquisition Area, as there is no overlap with rock lobster habitat/biological depth range by the Otway Deep West and South Acquisition Areas. The vessel will be acquiring in water depths of 200 m or less for a total of 4 days (including consideration of standby/downtime) spread over a period of approximately 50 days total survey time within Swaths 1 and 2 of the Central Acquisition Area. Given the maximum depth range of this species (<200 m), this is the maximum duration that rock lobster would be exposed to sound levels that may cause sub-lethal effects.

Modelled estimates indicate that 708 t of legal-sized rock lobster biomass (i.e. greater than carapace lengths of 105 and 110 mm for females and males, respectively) was present in the Western Zone Warrnambool Region of the VIC rock lobster fishery during 2016/17 (VFA 2018). This estimate provides a general measure of fishable stock. Assuming that this biomass is evenly spread across rock lobster habitat within the Warrnambool Region (i.e. to depths <200 m) (as indicated by the spread of catch data from 2012 to 2017, 5.7 t of this biomass would have come from the area ensonified by the MSS (0.8% of the Warnambool Region of the Western Zone). Given the small percentage of the biomass that could be exposed to sub-lethal effects and that the duration of exposure is limited to 4 days over a 50 day period, the impact of sub-lethal effects (i.e. impairment of reflexes, damage to statocysts and righting) on the southern rock lobster population is considered to be minor.

With respect to berried females in the ensonified area, the study by Day et al. (2016) reported no effects on embryos early in development within 1 to 1.5 km of the seismic source. Furthermore, the period during which females carry the eggs prior to release occurs from June to August, which is outside of the survey period, and many females will have released their eggs by the time the survey commences (i.e. hatching commences in September). However, hatching will continue to occur from October to November, i.e. at the time when the seismic survey is proposed, and so there is potential spatial and temporal overlap with rock

lobster larval stages (nauplius and phyllosoma phases). The modelling predicts the spatial extent of ensonification would only extend 110 to 166 m from the source within the rock lobster habitat, i.e. <200 m water depth, and over a period of 4 days spread over 50 days duration. Recent studies have investigated the impact of seismic sound on lobster embryos (Day et al. 2016) and reported that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure (Day et al. 2016). Any potential impacts on larval biomass is expected to be very localised and short-term, with negligible population level effects compared to the natural high rates of planktonic turnover.

Based on the above assessment, impacts to rock lobster life history stages as a consequence of the seismic survey are therefore expected to be minor.

Table 4.5: Summary of modelled impact ranges at the seabed for invertebrates based on Day et al. (2016) received levels

Invertebrate group	Species	Day et al. (2016a) exposure level	Predicted impact distance (R_{max})(m)
			Single shot (sub-lethal effects)
Crustaceans	Rock lobster, giant crab	209 dB re 1µPa (Lpk-pk)	260

4.1.3.2.2 Southern rock lobster fishery

Commercial vessels in the VIC and TAS rock lobster fisheries fish waters to depths around 200 m, with the majority of catches taken in depths less than 60 m (DEDJTR 2016b; Hartman 2013). Data obtained from the VFA for southern rock lobster catches in VIC waters from 2013 to 2017 shows that there were no more than four active licence holders fishing in areas within the Activity EMBA in any year during that period. The data shows that the majority of fishers operate outside the survey area, with the highest density of catches taken in depths less than 100 m. As reported above, the area of rock lobster habitat (<200 m depth) plus 260 m buffer that may be exposed to sound levels above the 209 dB threshold is 122.2 km2 (or 0.8% of the Western Zone Warrnambool Region of the VIC rock lobster fishery). There is no overlap of survey activities in water depths of <200 m in TAS and SA State waters.

Total catch of rock lobster in the Western Zone ranged from 209 to 261 t (average 237 t) for the period 2010/11 to 2016/17 (https://vfa.vic.gov.au/commercial-fishing/commercial-fish-production#fp-srl-year, accessed 14 Feb 2019). No catch data for this period is available for the area of the active fishery located within the survey area due to confidentiality limits (Principal Policy Analyst, VFA 12 Feb 2019). However, based on the proportion of rock lobster habitat that may be ensonified by seismic sound during the survey (0.8%), catches within this area may have averaged around 2 t during this 2010/11 – 2016/17 period. Catches across the Western Zone in the earlier three-year period (2007/8 – 2009/10) ranged from 587 – 685 t (average 263 t). This is the most recent period in which sufficient vessels recorded catches from within the ensonified area to allow publication of this data, which indicates that between 6.3 and 10.6 t (average 8 t) were taken from the area of rock lobster habitat that may be ensonified by seismic sound during the survey. This equates to approximately 3% of the total catch taken at that time. It is noted that historic catches within the larger Operational Area represent a larger proportion of the total catch for the fishery, i.e. 130 tonnes for the period 2008 to 2017. This is further discussed later in Section 4.3 as it is associated with physical interaction within other marine users (e.g. potential for displacement).

Although Day et al. (2016a) reported sub-lethal effects in field experiments, the study also highlighted potential adaptation of lobsters to statocyst damage and no ensuing impairment to righting reflexes (Day et al. 2016). Previous to this study, laboratory-based studies did not find effects on righting (turnover rates), with no differences observed between control and exposed animals to levels from 202 to 227 dB re 1 µPa (Payne et al. 2007). Further, one of the few studies to explore the issue of the effects of seismic on catch rates for lobster found no statistically significant correlative link between seismic surveys and changes in commercial rock lobster (Panulirus cygnus) catch rates associated with acute to mid-term mortality over a 26-year period in western Victoria (Parry and Gason 2006). Given the small area of ensonification to levels that could cause sub-lethal effects and that the duration of exposure is limited to 4 days over a 50 day period, the impact of sub-lethal effects (i.e. impairment of reflexes, damage to statocysts and righting) on catch and catchability lobsters is considered to be minor.

Based on the above assessment, impacts to rock lobster fisheries as a consequence of the seismic survey are therefore expected to be minor.

Table 4.6: Percentage overlap of rock lobster fisheries with the area of rock lobster habitat impacted by seismic activities

Fishery	Percentage overlap with state fisheries
Victorian Western Zone	Warnambool Region: 0.8% Portland Region: 0% Apollo Bay Region: 0%
Tasmania	0% of waters shallower than 800 m within survey area
South Australia	0% of waters shallower than 800 m (i.e. MFA 58) within survey area

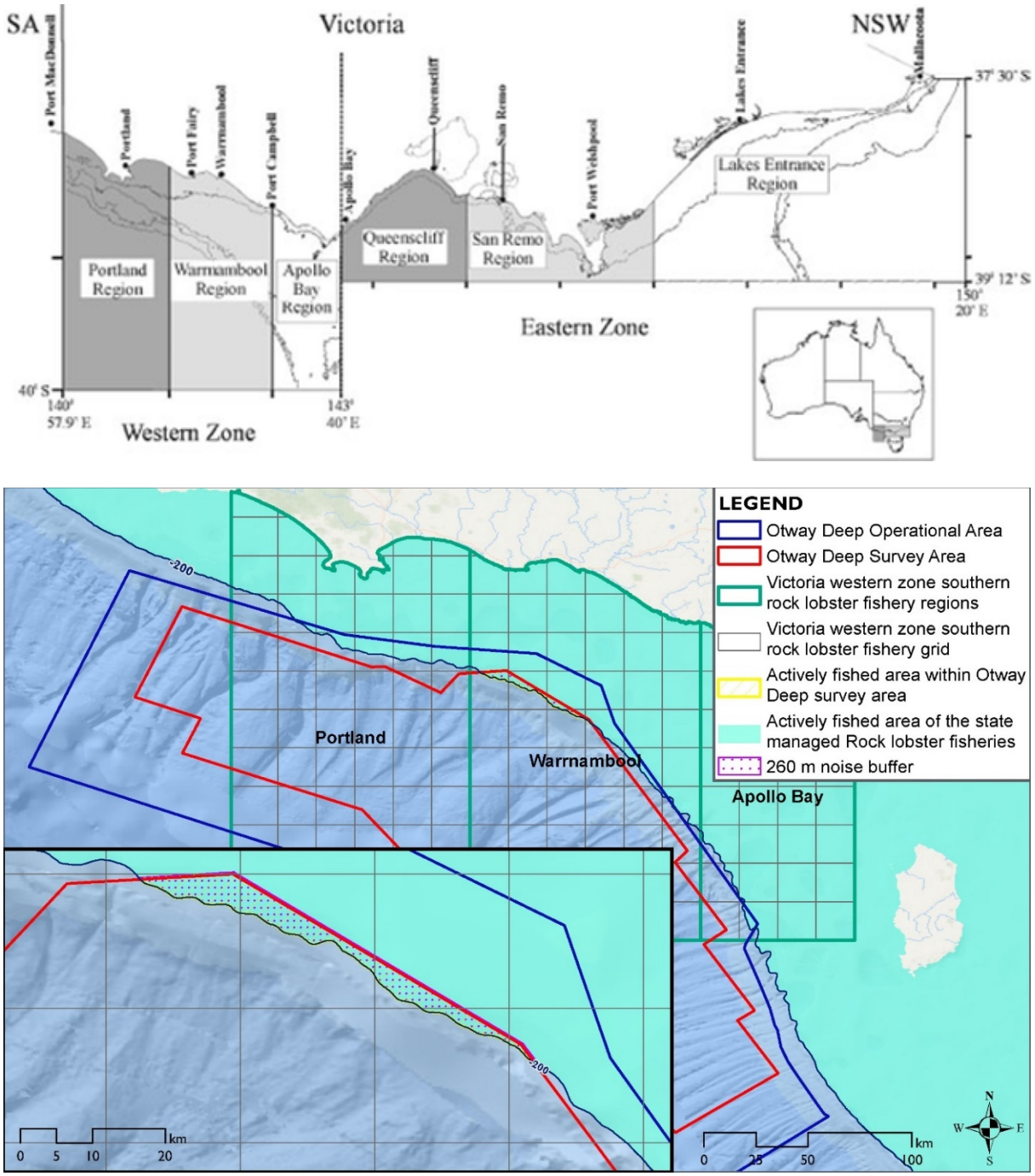

Figure 4.1: Western zone of the Victorian southern rock lobster fishery (above); and overlap of actively fished areas with the Otway deep survey and Operational Areas (below)

4.1.3.2.3 Giant crab

Giant crabs (Pseudocarcinus gigas) are broadly distributed across southern Australia where they are found at depths between 18 and 400 m. They are most abundant along the edge of the continental shelf. Across this distribution they are considered a single biological stock (Levings 2008). The area of giant crab habitat that overlaps the survey area (i.e. <400 m depth) that may be exposed to sound levels above the sub-lethal level described by Day et al. (2016a), is 296 km2 (all within the Central Acquisition Area as there is no overlap with giant crab habitat/biological depth range by the West and South Acquisition Areas). When compared with the total area of available giant crab habitat (18 to 400 m) across the Western Zone of the Victorian giant crab fishery (i.e. 17,894 km2), this equates to 1.64% of available giant crab habitat that could be ensonified above sub-lethal effect thresholds.

However, adult giant crabs undertake seasonal movements in order to remain in sea water temperatures between 12 and 14˚C (Levings 2008). As a result, females and males are most abundant at depths of 110-180 m in summer and 190 to 400 m in winter (Levings and Gill 2011), thereby reducing the crab biomass exposed to seismic sound during the survey period. Giant crabs found in habitat adjacent SA and TAS state waters will not be impacted because survey activities will not occur in water depths less than 400 m in these state waters boundaries.

Sound modelling results for the Otway Deep MSS predicts potential for sub-lethal effects (no mortality) in giant crabs between 175 and 260 m from the seismic source based on the Day et al. (2016) effect threshold (209 dB re 1µPa (peak to peak)) for lobsters and applied to giant crab as a proxy for crustacean species (recommended by the study authors). This is a conservative threshold based on previous species-specific studies that have investigated the effect of seismic on crab species and have not recorded mortality or stress bioindicators or avoidance behaviour. No evidence of mortality-associated population effects such as reduced abundance or catch rates were reported in snow crabs up to 12 days after exposure to received levels of 224 dB re 1 µPa (peak) (Christian et al. 2004). This same study also found no stress bioindicators in snow crabs (Christian et al. 2004).

It is possible that infilling and/or repeat acquisition of lines may be required where gaps in the seismic data acquired are evident, e.g. due to shut downs for cetacean mitigation. In the event of infill or completing gaps within sail lines, the time between initial seismic data acquisition along that line would be at a minimum >24 hours, and in reality, could be days to weeks, recovery would have occurred over this time.

With spawning occurring outside of the survey period from May to August, and eggs held by females until release in shallower shelf waters of <260 m (i.e. inshore of the survey area) during spring (peaking during October, with low level hatching in November), the impacts of seismic sound on reproduction is expected to be minor.

Minor impact is also expected on planktonic stages, which laboratory studies show are comprised of five zoeal and one megalopal stages that may have a planktonic period of up to three months (Gardner et al. 2004). Distribution and survival of the planktonic stages is dependent on water temperature and the ability of larvae to vertically migrate within the water column in order to maintain position within favourable thermoclines (Gardner et al. 2004). Although little is known about the ecology of giant crab larvae in the wild, long-shore currents such as the Zeehan Current that occur within the area of the proposed MSS are expected to play an important role in dispersal of giant crab larvae away from the survey area (e.g. Richardson et al. 2017). In addition, seasonal upwelling events such as the Bonney Upwelling, which occurs soon after hatching of giant crab larvae in November, are expected to boost the ecosystem food chain and be important for giant crab planktonic stages (Levings 2008). Because of its regional importance the Bonney Upwelling is defined as a KEF with a spatial boundary derived through review of enhanced chlorophyll occurrence for summer seasonal data. The distance between this KEF and the area ensonified by seismic activity is 21 km, and therefore planktonic stages of giant crab (and other species) present in this area are not expected to be impacted by the MSS.

Given the small percentage of the area of giant crab habitat (<400 m) that could be exposed to potentially sub-lethal effects and that the duration of exposure is limited to 6 days over a 50 day period (total duration of time the seismic source is discharged over Swaths 1 and 2), the impact of sub-lethal effects (i.e. impairment of reflexes, damage to statocysts and righting) on the giant crab population is considered to be minor. Note that the survey vessel will only be acquiring data in water depths of 400 m or less for a total of 6 days for the entire survey season (inclusive of line turns and with part days rounded to full days), including 1.6, 3.4, 0.5 and 0.5 days in Swaths 1 to 4, respectively (Table 6.9).

Based on the above assessment, impacts to giant crab life history stages as a consequence of the seismic survey are therefore expected to be minor.

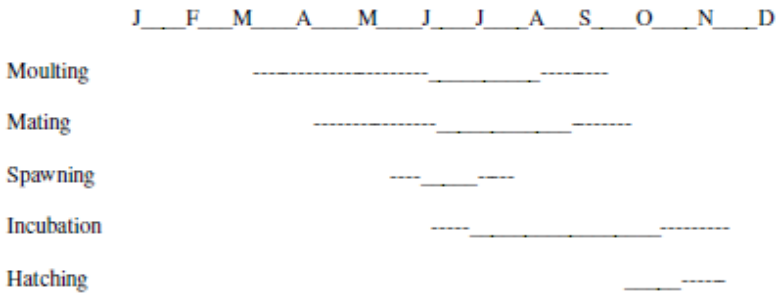

Figure 4.2: Proposed reproductive cycle of female giant crab. Solid lines represent peak periods in the events listed; dashed lines represent low levels of the events (Levings 2008)

4.1.3.2.4 Giant crab fishery

Operators within the Victorian Giant Crab Fishery typically target depths between 150 to 300 m, although stakeholder feedback indicates fishing may occur to depths of 400 m. Within this depth range (conservatively to 400 m) fishers target a narrow band of habitat along the edge of the continental shelf. The amount of this target habitat that may be exposed to sound levels above the 209 dB threshold for invertebrates (ensonified area) comprises 16.6% of the total fishing area, between 150 – 400 m deep, within the Western Zone of the fishery. No overlap of the ensonified area with habitat in this depth range is found adjacent other state waters due to a revision of survey plans to avoid slope waters targeted by Tasmanian fishers.

In the absence of biomass data for the giant crab stock, catch and effort data provides the most suitable means of assessing potential impacts of seismic sound on giant crab, although this data is limited due to the small number of vessels operating in the fishery and confidentiality limits which preclude publication of data if there are less than five vessels involved. For example, catch data is not available for the Western Zone of the fishery during 2016/17 (the most recent year reported by the VFA https://vfa.vic.gov.au/commercial-fishing/commercial-fish-production#fp-gc-year, accessed 6 March 2019). However, in the previous year (2015/16) a total of 9 t of giant crab was caught throughout this zone and, based on percent overlap of fishing area within the survey area (16.6%), approximately 1.5 t of this total catch may have been taken within the survey area.

Similarly, catch data for fisheries reporting blocks overlapping the 150 – 400 m depth range within the survey area could not be provided by the VFA for the most recent five years (2013/14 to 2017/18) because only one to four operators (average 2.4) reported catches from these blocks (even when data was pooled across the 17 blocks in question). However, data for the year 2012/13 – six years ago and the most recent year in which catch data is available for both the broader Western Zone and blocks within the survey area – approximately 6.3 t (63%) of the overall catch of 10 t came from within the survey area.

This significantly higher proportion of overall catch within the survey area may in part be due to the large size of the fisheries reporting blocks (approximately 10 x 10 nautical miles) relative to the narrow band of fishing habitat. Nevertheless, the overlap between ensonified and fished areas is not expected to impact the catch of giant crab fishers mainly because of the limited potential for impacts from seismic sound on individual giant crabs particularly considering that seasonal movement of individual giant crabs will result in a portion of the fishable stock being absent from the survey area over summer when the survey will occur.

Furthermore, the survey vessel will only be acquiring data in water depths of 400 m or less for a total of 6 days for the entire survey season (inclusive of line turns and with part days rounded to full days), including 1.6, 3.4, 0.5 and 0.5 days for Swaths 1 to 4, respectively (Table 6.9). Swath 5 does not extend into waters less than 400 m. Given the maximum biological depth range of this species (<400 m), this is the maximum duration that fishable biomass would be exposed to sound levels that may cause sub-lethal effects. Sound avoidance behaviours could have a more longer term impact on populations, particularly if animals migrate out of an area in which seismic surveys are conducted. However, the study by Christian et al. (2003) found that snow crabs did not move to avoid low-frequency sounds. In a more recent study, Morris et al. (2018) concluded no effect on snow crab fishery catch rates in the short (days) or longer term (weeks) following a seismic survey over the continental slope. Avoidance, and therefore changes in catchability of giant crab by fishers is therefore not expected during the survey.

Based on the above assessment, impacts to the giant crab fishery as a consequence of seismic sound during the survey are therefore expected to be minor. The impacts associated with physical interaction within other marine users (e.g. potential for displacement) are assessed in Section 4.3.

Table 4.7: Time period within swaths 1-5 of the central acquisition area

Swath	Number of days acquiring data in depths <400 m (depth limit for giant crab fishery)
1	1.6
2	3.4
3	0.5
4	0.5
5	0

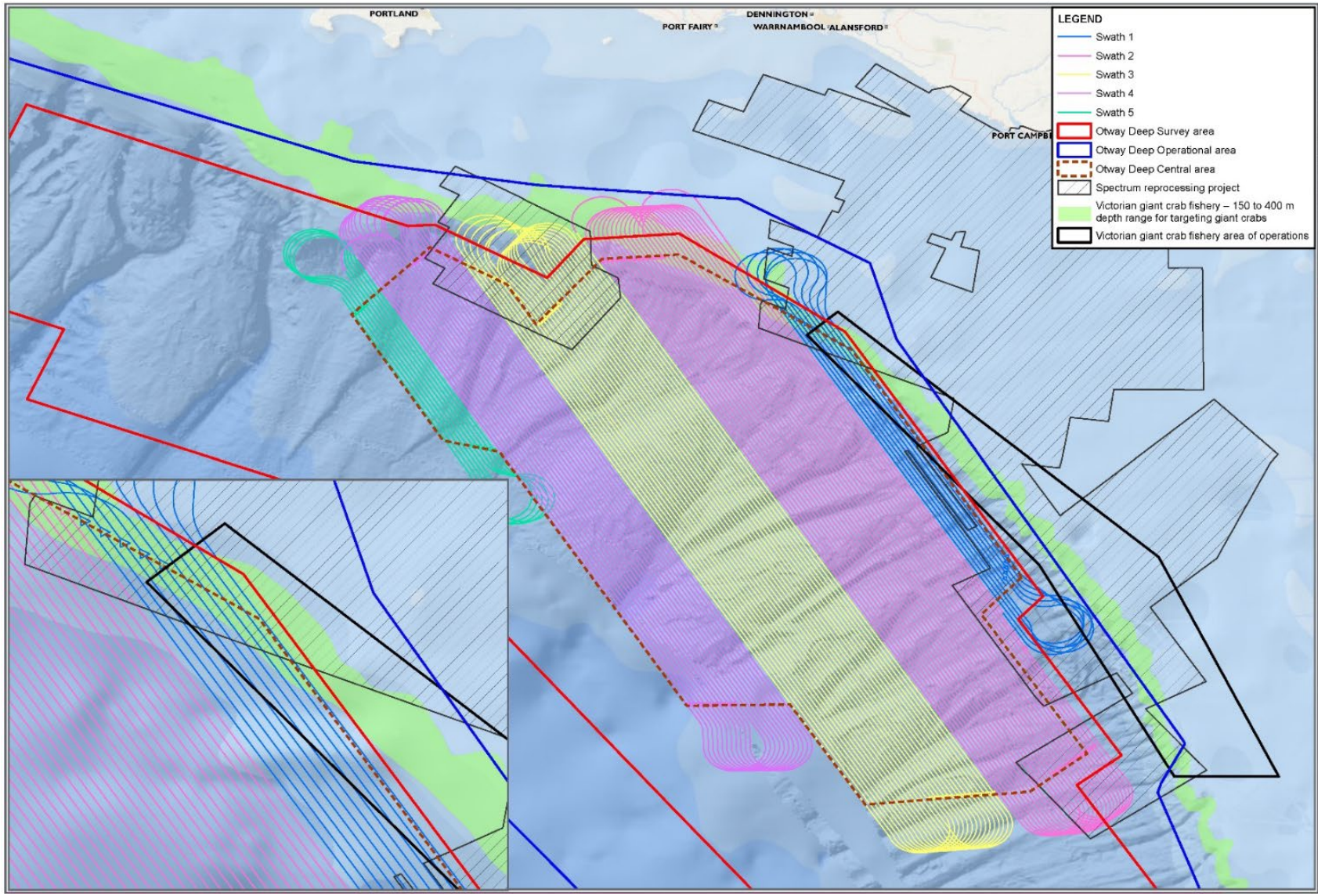

Figure 4.3: Western zone of the Victorian giant crab fishery and overlap of actively fished areas with the Otway deep survey and Operational Areas

4.1.3.2.5 Squid

Research on the impacts of low frequency sound to marine invertebrates is limited (Caroll et al. 2017). There have been no observed cephalopod mortalities directly associated with seismic surveys. Studies exposing cephalopods to near-field low-frequency sound have shown received levels may cause anatomical damage, however research is limited. Anecdotal data from strandings of giant squid (Architeuthidae spp.) showed tissue, statolith and organ damage after seismic surveys (Guerra et al. 2004). André et al. (2011) demonstrated injury to four species of cephalopod in 200 litre glass tanks from exposure to sweeping waves 50 to 400 Hz at levels of 157 dB SPL produced continuously for up to two hours. However, the exposure experiments in both of these studies are complicated to relate to commercial seismic surveys due to unknown exposure levels for stranded squid, or the duration of the exposure event.

Furthermore, the effect of noise on a receptor is more likely to be based on behaviour at lower sound levels (Carroll et al. 2017), and behavioural effects are the most ecologically realistic consideration when assessing the impacts of seismic surveys (Bruce et al. 2018). Researchers have cautioned the extrapolation of conclusions drawn from behavioural studies in artificial tanks such as those by André et al. (2011) due to the wavelengths of sound in water and the practical restrictions of the size of the tanks making it essentially impossible to do meaningful behavioural studies involving the broadcast of sound in a tank (Goodall et al., 1990; Popper et al., 2001; Montgomery, 2006; Gray et al., 2016).

McCauley et al. (2000) studied captive squid (Sepioteuthis australis) responses during a seismic survey, where squid showed a strong startle response to nearby airgun start up and evidence that they would significantly alter their behaviour at an estimated 2 to 5 km from an approaching seismic source. Squid showed avoidance of the airgun by keeping close to the water surface at the cage end furthest from the airgun, appearing to make use of the sound shadow measured near the water surface (an almost 12 dB difference) (McCauley et al. (2000)).

McCauley and Fewtrell (2012) studied the behavioural responses of squid to seismic sound levels. In general, squid displayed an increased frequency of alarm responses, particularly at higher sound levels, and increased swimming speed in the direction of the surface as the airgun approached and remaining relatively stationary near the water surface as the airgun signal became most intense. The authors again suggested that the squid detected the sound shadow (approximate 12 dB decrease in noise levels at the water's surface compared to the levels at depth), and therefore remained at the surface while the airgun signals were most intense (i.e. avoidance behaviour) (McCauley and Fewtrell 2012). This behaviour of becoming motionless is a common component of 'crypsis' in squid, and one that squid commonly exhibit when threatened (Smith, 1997).

The species of squid targeted by fisheries in the vicinity of the proposed MSS is Gould's squid (Nototodarus gouldi). This species is found to a depth of 825 m but is most abundant in depths of 50 – 200 m. It is considered to be a single biological stock across south-eastern Australian waters. Individuals aggregate near the seabed during the day and move into the water column at night to feed. Sexual maturity is reached in 6-9 months, spawning occurs throughout the year, and death occurs shortly after spawning. Prey of Gould's squid include small fish such as pilchards and barracouta, and pelagic crustaceans. Their predators include sharks, large fish such as John dory and tunas, birds and marine mammals.

The area of potential habitat for Gould's squid within the survey area (to a depth of 825 m) is 800 km2, which is 0.2% of the potential habitat for this species within the broader area of the SSJF. In assessing impacts of seismic sound on populations of Gould's squid, modelling indicates that a received level of 162 dB re 1µPa2.s (representative of eliciting a strong alarm (avoidance) response in squid (Fewtrell and McCauley 2012)) could extend up to 3.4 km from the seismic source. This increases the area of squid habitat (to 825 m depth) ensonified by seismic activity at levels eliciting avoidance behaviour by individuals to 1,376 km2, or 0.35% of the habitat for this species within the area of the SSJF.

Whilst catch data indicates that Gould's squid are present across the area of the SSJF there are locations within this range where they are likely to be more abundant. In particular, the Bonney Upwelling is a seasonal phenomenon comprised of regular cold-water upwelling plumes that occur along the Bonney Coast (between Robe, SA and Portland, VIC) from November to March. It is an area of high productivity that supports a complex food web, and because of its regional importance it is defined as a key ecological feature (KEF) with a spatial boundary derived through review of enhanced chlorophyll occurrence for summer seasonal data (CoA 2015). The distance between this KEF and the area ensonified by seismic

activity is 21 km, which is too far for sound-related impacts from the MSS to occur within it. However, the area between the KEF and the survey area is targeted by the SSJF and CTS (Butler et al. 2002), with catch rates indicating that it is an area of relatively high squid abundance. Given the proximity of this area to the Bonney Upwelling it is likely that this is an important feeding area for Gould's squid, and because of the strong startle response exhibited by squid to seismic sound (McCauley et al. 2000) there is potential for feeding behaviour to be disrupted during the proposed MSS. There is also potential for their prey (small fish and crustaceans) to also be impacted, for example by swimming faster in more tightly cohesive groups and changing location in the water column. This may have further impact on feeding capacity of squid, although once the acoustic disturbance is removed fish typically return to normal behaviour within about an hour.

The partial overlap between the fishing areas and the area ensonified by seismic sound at levels that may result in behavioural disturbance to squid indicate that behavioural disturbance, in particular to feeding, is likely as a consequence of the MSS. However, the extent of this overlap is likely to be exaggerated because the process of generating the fishing intensity maps requires smoothing and spreading of estimated fishing effort that results in the total fishing area appearing larger than reality (ABARES 2017). Furthermore, a review of fisheries data by SETFIA (2018) indicates that these catches are largely taken from January to June, with a peak between March to May outside of the planned MSS period.

The above information indicates that there may be behavioural and hence feeding disturbance to Gould's squid aggregated in the vicinity of the Bonney Upwelling. However, whilst difficult to quantify using available data, the biomass of squid subjected to this impact will be low relative to the overall biomass of squid in the area. Furthermore, it is important to note that the survey area will not be subject to seismic sound for an extended period because sail lines will take 15 – 25 hours to complete and each subsequent sail line will typically be 8 to 12 km away from the preceding line. Therefore, exposure to sound levels that may have behavioural implications will be limited and/or intermittent, and squid are expected to recover between sail lines.

Several researchers have also noted that squid show fewer alarm responses with subsequent exposure to the seismic source (McCauley et al. 2000; Fewtrell and McCauley 2012; Mooney et al. 2016) and, in minimising impacts to squid, McCauley and Fewtrell (2012) have suggested that a ramped (i.e. gradual increase in signal intensity) airgun signal and prior exposure to airgun noise decreases the severity of the alarm responses in squid. The soft-start (and 'ramping up') procedures that will be employed during the seismic survey will therefore aid in reducing the extent and severity of the alarm responses in squid.

In conclusion, the biomass of squid that may be subjected to seismic activity is expected to be small compared to the biomass of the broader stock, and squid in the area are expected to move away as the airgun array approaches and move back to the area and resume normal feeding behaviour once the seismic source has passed. Squid within the area of the Bonney Upwelling KEF will not be affected, and no mortality or injury to squid is anticipated as a consequence of the MSS.

4.1.3.2.6 Squid fishery

Gould's squid is a target species of the Tasmanian Scalefish Fishery. However, catch data for this fishery is included in data for Commonwealth Trawl Fishery, and as such assessment of impacts to squid fisheries due to seismic sound is based on data for the relevant Commonwealth fisheries. Within these fisheries Gould's squid is not considered to be overfished or subject to overfishing.

Jurisdiction of the Commonwealth Southern Squid Jig Fishery (SSJF) extends across Australian Fishing Zone (AFZ) waters adjacent to SA, TAS, NSW, VIC and southern QLD, although most fishing occurs in continental shelf waters near Portland, VIC. SSJF vessels typically operate at night in continental shelf waters between depths of 60 to 120 m using the jigging method (AFMA 2018b), although fishers can operate in waters deeper than these target depths (A. Levings, Fisheries Liaison Officer pers comm. March 2019). The fishery is open year-round although fishing generally occurs from January to June (SETFIA 2018). Information provided by an operator in the SSJF indicates that fishing activity in the vicinity of the MSS occurs from February to the end of May, and temporal analysis of catch data within the MSS Operational Area by SETFIA (2018) was limited to the period March to May due to the low number of vessels (< 5) recording catches during other months. There is therefore expected to be limited temporal overlap between the end of the proposed MSS in February and the main period of fishing by squid fishers.

The bulk of catches in the SSJF occur on shelf waters near Portland, and inshore of the survey area. Fishing intensity maps for the SSJF indicate partial overlap between fishing areas and the MSS area. However, the extent of this overlap may be exaggerated because the process of generating the fishing intensity maps requires smoothing and spreading of estimated fishing effort that results in the total fishing area appearing larger than reality (ABARES 2017). The total catch of squid by the SSJF in 2017 was 213 tonnes (ABARES 2018). In contrast, pooled catch for the ten-year period 2008-2017 within the Operational Area (data pooled for confidentiality reasons) was 366 tonnes (SETFIA 2018). For this same ten-year period 12, 17 and 13 SSJF vessels recorded catches during March, April and May from within the Operational Area, respectively (SETFIA 2018). Data for other months was not available due to confidentiality reasons, prohibiting direct assessment of squid catch potentially impacted by the MSS. However, as noted in the previous section, the area of potential Gould's squid habitat within the survey area (to 825 m) that may be targeted by the SSJF is 800 km2, which is 0.2% of the broader area open to this fishery.

Squid are also caught by demersal trawling as incidental catch in the CTS, although in recent years catches of squid in this fishery have been greater than that for the SSJF (ABARES 2018). In 2017 569 t of squid were captured by the CTS (ABARES 2018). Operators within the CTS are prohibited from fishing most areas of the SESSF deeper than 700 m (as well as other areas described in the Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016), although in the West Acquisition Area the boundary of the prohibited area extends to more than 2,500 m. The area of potential habitat for Gould's squid within the survey area (to a depth of 825 m) that is open to trawling is 700 km2, which is 0.5% of the total habitat for this species open to trawling across the area of the CTS (149,036 km2) and 1.0% of the total habitat for this species open to trawling west of Tasmania. Limiting the area to west of Tasmania is based on stakeholder feedback about fishing operations, and assumes operators fishing in this area do not trawl in areas east of Tasmania. Analysis of CTS catch data for the period 2008 – 2017 (data pooled for confidentiality reasons) indicates that Gould's squid comprised 10% of the total catch within the Operational Area of the MSS (SETFIA 2018). However, because the Operational Area is larger and overlaps more area fished by the CTS than does the survey area, the amount of squid catch potentially impacted by seismic activities during the MSS will be considerably lower than indicated by this percentage.

Based on the above assessment, the survey area represents a minor portion of the area actively fished for squid by the SSJF and CTS, and limited impact on catches are expected as a consequence of survey activities (for assessment of displacement impacts refer to Section 4.3). This is further supported by information provided by Carroll et al. (2017), who tested the potential effects on catch rates or abundances on cephalopods and found no significant differences between sites exposed to seismic operations and those not exposed.

Table 4.8: Percentage of the southern squid jig fishery within target species depth range impacted by seismic activities

Total area of the fishery to 825 m depth (km^2)	Percentage overlap with survey area	Gould's squid depth range
389, 884	0.91% of total fishery jurisdiction 0.19% of fishery to species known depth range	Estuaries to 825 m (most abundant 50 – 200 m)

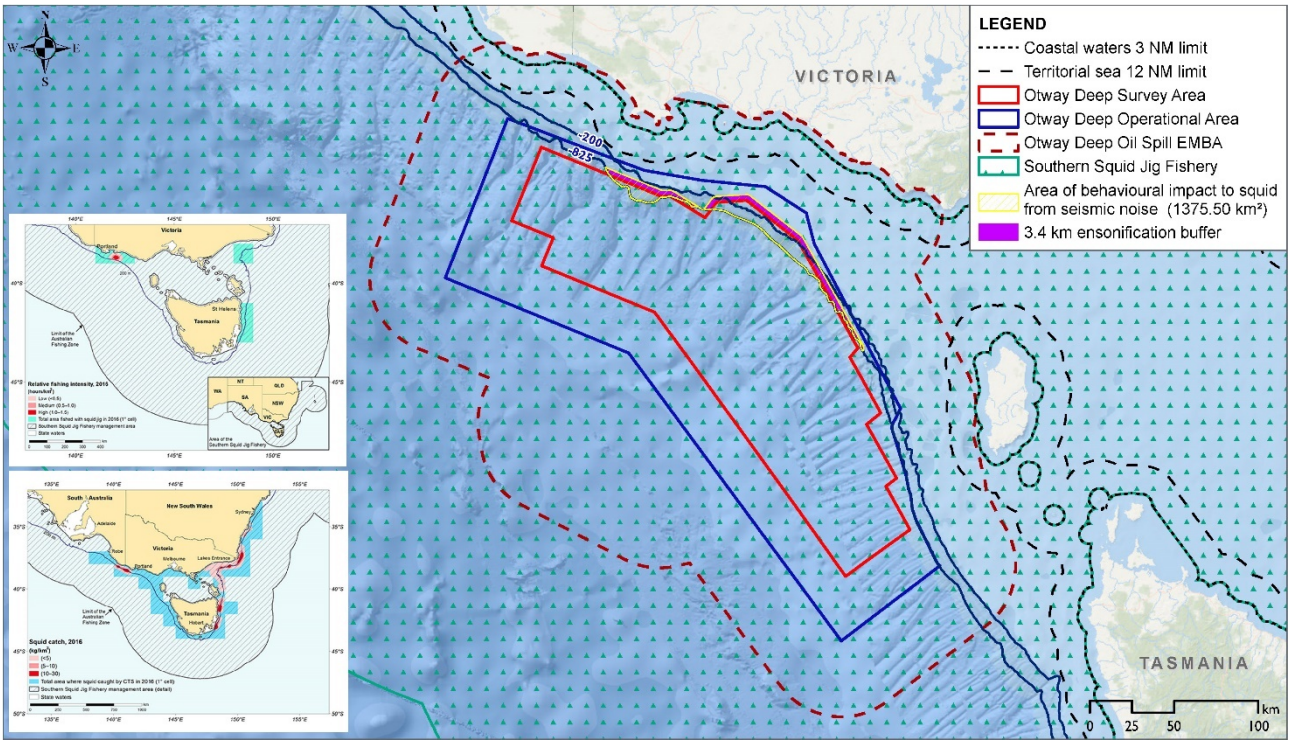

Figure 4.4: Areas of fishing intensity by the squid jig fishery and squid catches by the Commonwealth trawl fishery. Also shown is the area of behavioural impact to squid

4.1.3.3 Impacts to finfish

Commercially targeted fish species that may occur within the Activity Area include blue-eyed trevalla, blue grenadier, blue and silver warehou, flathead, gemfish, gummy and school shark, sawshark, jackass morwong, john and silver dory, ocean perch, pink ling, and silver trevally (SETFIA 2018). These species vary considerably in size and ecology. They also have a broad range of biological depths, although the maximum depth of most is less than 800 m, but with two (pink ling and ribaldo) found to 1,000 m. The preferred habitat for these species is the continental shelf and slope, with the West Tasmanian canyons identified as having a wide diversity of fishes to depths of 350 m (Section 4.3). All of these fish species are demersal (living in or near the seabed) excluding the mackerel species, redbait and sardine which are pelagic (living in the water column). These pelagic species are widely distributed schooling species targeted by the Commonwealth Small Pelagic Fishery and State purse-seine fisheries such as the VIC Multi-Species Ocean Fishery. These fisheries are unlikely to be active within the Survey Area and direct impacts on mobile pelagic species are expected to be minor (McCauley 1994). The only BIA for fish species that overlaps the survey area is for white shark distribution, with foraging BIAs located >10 km from the survey area around known fur seal breeding and haul out locations.

The effects of underwater noise between on these species will also vary depending on parameters such as individual size, age, sex and condition, among other physiological aspects, and the topography of the benthos, water depth, sound intensity and duration. Furthermore, the effect of noise on a receptor may be either physiological (e.g. injury or mortality) or behavioural, with the latter more likely at lower sound levels (Carroll et al. 2017). Behavioural effects are the most ecologically realistic consideration when assessing the impacts of seismic surveys (Bruce et al. 2018), and include changes in schooling and feeding behaviour, decreased predatory avoidance (although predators are also likely to be similarly impacted), and disruption to spawning.

Behavioural observations of captive fish and squid were made before, during and after air gun noise exposure in a study carried out by Fewtrell and McCauley (2012). The results indicated that as air gun noise levels increase, fish respond by moving to the bottom of the water column and swimming faster in more tightly cohesive groups. In addition, behavioural responses such as fish huddling in groups and swimming towards the lower part of the water column in response to air gun noise have been observed in studies by Chapman and Hawkins, (1969), Dalen and Knutsen (1987), Dalen and Raknes (1985) and Slotte et al. (2004).

A range of responses have also been observed when studying the behaviour of wild fish species in the presence of anthropogenic sounds. Some fishes have shown changes in swimming behaviour and orientation, including startle reactions (Pearson et al. 1992; Wardle et al. 2001; Hassel et al. 2004). Sound can also cause changes in schooling patterns and distribution (Pearson et al. 1992). However, researchers have observed that once acoustic disturbances are removed, fish return to normal behaviour within about an hour (Pearson et al. 1992; McCauley et al. 2000; Wardle et al. 2001).

Trials with captive fish indicate that some species exhibit alarm and avoidance responses to seismic discharges, such as swimming faster, swimming to the bottom of the cage, and tightening of school structure (McCauley et al. 2000). The tightening of school structure behaviour suggests the survey is unlikely to adversely affect the aggregation behaviour of spawning fish. These trials also indicate the following:

- Fish generally show little evidence of increased stress from exposure to seismic signals unless restricted from moving away from the source
- Fish may become acclimatised or habituated to seismic signals over time and the severity of the startle responses decreases with exposure time
- No significant measured stress increases (blood cortisol concentrations) which could be directly attributed to airgun exposure.

Potential recovery in European seabass and European eel exposed to seismic sound was investigated by Bruintjes et al. 2016 and Radford et al. 2016. European seabass experienced 12 weeks of impulsive noise showed no differences in stress, growth or mortality compared to those reared with exposure to ambient-noise playback (Radford et al. 2016). Anthropogenic noise-induced effects quickly dissipated and European eel and European seabass fish showed rapid recovery of startle responses and startle latency within 2 minutes after noise cessation (Bruintjes et al. 2016). Seabass also showed complete recovery of ventilation rate when exposed to peak SPLs of 200.1, 200.7 and 201.5 dB re 1 µPa; whereas eels showed rapid albeit incomplete recovery compared with ambient conditions.

The potential impacts to spawning are described in Section 4.1.4.1.1. The available information for species likely to occur within the survey area shows that most undertake feeding or spawning migrations and/or form mobile schools. Therefore, whilst detailed information regarding site specificity (e.g. home-range characteristics) is generally lacking for these species, they can be expected to actively move away from an approaching seismic source once sound levels reach a threshold level (Popper 2018).

When considering physiological impacts, the species likely to occur within the Otway Deep survey area have swim bladders whereas shark species do not. Popper et al. (2014) cite studies on seismic sound effects on fish and state that no studies have linked mortality of fish, with or without swim bladders, to seismic noise from airguns or in experimental studies replicating seismic sound fields (Popper et al. 2005; Boeger et al. 2006; Popper et al. 2007; Hastings et al. 2008; Halvorsen et al. 2011, 2012; Casper et al. 2012; McCauley and Kent 2012; Miller and Cripps 2013; and Popper et al. 2015). Empirical evidence comes from a study by Wagner et al. (2015) which exposed gobies to seismic sound at a level greater than the mortality and potential mortality threshold proposed by the Popper et al. (2014). The fish were exposed to six discharges at an average peak SPL of 229 dB re 1 µPa. Fish were monitored for 60 hours post exposure and no mortality or significant physiological damage (hair cell loss or otolith damage) were observed. In another study, individuals of four fish species were exposed to piling noise levels above a peak SPL of 207 dB re 1 µPa, but did not suffer any mortal or potentially mortal injuries (Casper et al. 2012). The guidelines for “mortality and potential mortality” and for “recoverable injury” are therefore considered conservative and precautionary.

A study by McCauley et al. (2003) found evidence of damage to sensory hair cells in the ears of snapper exposed to around 212 dB re 1 µPa in a caged trial. However, sensory hair cells are constantly added in fishes (Popper and Hoxter 1984; Lombarte and Popper 1994) and are also replaced when damaged (Lombarte et al. 1993; Smith et al. 2006; Schuck and Smith 2009). Therefore, any impacts to the hair cells of fish that could not avoid the seismic source would likely be temporary.

Underwater sound modelling carried out for the Otway Deep MSS for an airgun array source level of 3,475 in3 predicted received levels both at the seabed (relevant to demersal fish species) and maximum over-depth (i.e. through the water column, relevant to pelagic fish species), for single shot (per-pulse) and

cumulative 24-hour exposure (Table 6.11). Predicted levels were compared with Popper et al. (2014) fish exposure criteria for mortality/potential mortality, recoverable injury (213 dB Lpk) and TTS (186 dB SELcum). The sound modelling predicted potential a range of effects from mortality to recoverable injury up to 50 m from the source for pelagic fish without swim bladders (e.g. sharks) and up to 110 m for all other pelagic fish species (Table 6.10). For demersal fish at the seabed effects are predicted to occur between 34 m (no swim bladder) to 166 m (other species). This is a conservative approach as there have been no studies to date that have documented mortality of fish from seismic, and because in reality there would be a range of effects within these impact ranges, including recoverably injury (Popper et al. 2014).

TTS is predicted to occur out to 3 km for all fish species (demersal and pelagic) based on a 24-hour cumulative exposure, however this is a conservative estimate and is based on the fish not swimming away from the source. There are no known areas in the survey area where site-attached fish species may occur, therefore it is anticipated that fish will temporarily move out of the ensonified areas predicted by the modelling. Previous studies have demonstrated recovery of sub-lethal effects, including damaged or lost auditory hair cells in the inner ear of fishes, with recovery to control conditions reported between 3 to 7 days (Lombarte et al. 1993; Amoser and Ladich 2003; Smith et al. 2004, 2006). Smith et al. (2006) further reported that full recovery did not require a full set of hair cells, as these do not appear to be necessary for normal auditory responses. Studies have also shown that neuromasts and their associated hair cells in the lateral line system recover much more quickly than this, e.g. between 48 and 72 hours (Harris et al. 2003; Ma et al. 2008; Mackenzie and Raible 2012). Recovery in fish was also observed by McCauley et al. (2000), which showed that fish returned to normal behavioural patterns within 14 to 30 minutes after the cessation of airguns firing. In a more recent review by Popper (2018), recovery in fish from TTS would start as soon as the most intense sound ends and would be within 24 hours (Popper 2018). It is possible that infilling and/or repeat acquisition of lines where gaps in the seismic data acquired are evident, e.g. due to shut-downs for cetacean mitigation. In the event of infill or completing gaps within sail lines, the time between initial seismic data acquisition along that line would be >24 hours, meaning that recovery of fish species would have occurred over this time.

A recent study in the Gippsland marine region by Bruce et al. (2018) found little evidence of consistent behavioural responses, i.e. movement out of the area of the seismic survey, from two species of shark. In the same study, the tiger flathead was reported as moving out of the seismic survey area, however was no indication that tiger flathead departed the experimental area as a result of the seismic survey itself. Although some studies have shown a degree of residency for flathead species, (Fetterplace et al. 2016), all but one tiger flathead departed the monitored area by mid-June of the study, suggesting a possible seasonal movement out of the area (Bruce et al. 2018). The range of flathead movement (i.e. increased swimming speed during the seismic survey period and changed diel movement patterns after the survey) was not sufficient to generate a significant displacement (Bruce et al. 2018). Slotte et al. (2004) also reported no change in short-term horizontal distribution of herring, blue whiting and mesopelagic species, however these species were found in deeper waters during seismic exposure compared to their pre-exposure distribution, indicating that vertical movement rather than horizontal movement could be a short-term reaction to seismic sound (Carroll et al. 2017).

In conclusion, the impacts on fish species within the survey area as a consequence of seismic activity are mainly expected to be behavioural. These are likely to be temporary as the seismic vessel traverses each survey line, localised in spatial extent, and most relevant to continental slope habitat which comprises only a small part of the overall survey area. Behavioural responses are more likely to result in changes in diel movements (vertical) rather than horizontal movements, and it is unlikely that fish will be displaced from the survey area, particularly given that the area will not be permanently ensonified for the whole duration of the survey. This is because the survey vessel will traverse sail lines starting inshore and moving offshore, with each subsequent sail line typically being between 8 and 12 km away from the preceding line. Fish exposed to received sound levels eliciting a behavioural response will therefore recover between sail lines.

Table 4.9: Summary of modelled impact ranges for fish (including sharks)

Fish group	Popper et al. (2014) exposure level	Predicted impact distance (R_{max})(m)	
		Single shot (sub-lethal effects)	Cumulative exposure (TTS)
Fish: No swim bladder (also applied to sharks)	213 dB re 1µPa (Lpk-pk) Mortality and potential mortal injury / recoverable injury	50 m (water column) 34 (seabed)	N/A
Fish: Swim bladder not involved in hearing, swim bladder involved in hearing	207 dB re 1µPa (Lpk-pk) Mortality and potential mortal injury / recoverable injury	110 (water column) 166 (seabed)	N/A
Fish: No swim bladder (also applied to sharks), swim bladder not involved in hearing, swim bladder involved in hearing	186 dB re 1µPa^2.s (SEL_{24h}) TTS	N/A	3 km (seabed and in the water column)

4.1.3.3.1 Impacts to finfish fisheries

Consultation with stakeholders has identified considerable concern over the impacts of seismic activities on commercial fisheries. As indicated in Appendix A and industry reports provided by SIV and TSIC, many concerns are general in nature. Where specific concerns are described those that are seismic-related can be summarised as (1) impacts to adults – impacts on catches due to behavioural changes or mortality/injury affecting catchability and reproduction, and (2) impacts to planktonic larvae – resulting in a loss of food for adults of commercial species, and loss of recruits to populations of commercial species.

Fish may avoid areas of seismic activity and fish schools may disperse or change feeding behaviour patterns. A potential consequence of this is fewer fish are attracted to baited traps or hooks, or target species may follow prey species away from the area during the survey, thereby resulting in a temporary reduction in the catchability of commercially valuable species. An example of this is provided by Wardle et al. (2001) who used a video camera to document the behaviour of fish in response to noise levels equivalent or greater than those in the proposed survey. This study showed that the resident fish on the site did not evade the active source until it was within a few metres. No direct mortality was observed at sound levels of up to 218 dB (Lpk).

Nevertheless, some fishers have expressed a believe that there is indeed a longer-term effect on fish catchability or presence in fished areas. This is difficult to determine given the difficulty in separating possible seismic survey effects out from other factors such as fishing pressure, climatic changes and variation in natural population dynamics. A series of studies have been undertaken to determine the effects of seismic surveys on fish catches and distribution, primarily in the United States and Europe (e.g. California: Greene 1985, Pearson et al. 1992; Norway: Dalen and Knutsen 1987, Lokkeborg and Soldal 1993; and UK: Pickett et al. 1994). While the conclusions from these studies are largely ambiguous, due to the inherently high levels of variability in catch statistics, one study noted that pelagic species appear to disperse, resulting in a decrease in reported catches during the surveys (Dalen and Knutsen 1987).

Engås et al. (1996) and Engås and Løkkeborg (2002) looked at the effects of a seismic exploration on fishing success for haddock (Melanogrammus aeglefinus) and Atlantic cod (Gadus morhua). They found that, compared to pre-seismic catches, there was a significant decline in the long line catch rate during and after the seismic study. The catch rate did not return to normal for five days after the end of the seismic study, although evidence of this decline being related solely to the survey is inconclusive. More recently, the same group used sonar to observe the behaviour of blue whiting and Norwegian spring spawning herring during a seismic operation and observed that fish would dive from the seismic source and not return until after the activity had stopped (Slotte et al. 2004). A study undertaken by the CSIRO and Geoscience Australia (Thomson et al. 2014) examined fisheries catches (ten species of interest) and catch rates for potential effects from 183 seismic surveys undertaken in the Gippsland Basin (Bass Strait). This study also found no clear or consistent relationships between seismic surveys and subsequent fisheries catch rates (Thomson et al. 2014).

In order to identify fisheries that may be impacted by the proposed seismic survey a review of publicly available information about Commonwealth and state-managed fisheries with jurisdictional boundaries that overlap the Activity EMBA was undertaken. The area within which the Otway Deep MSS Activity EMBA lies is generally an area of low relative catch levels (<50 kg/km2), although an area of medium relative catch levels is located from the SA/VIC border eastwards to Portland. Fisheries with jurisdictions that overlap the survey area are summarised in Table 4.10.

The two fisheries that target demersal fish species likely to occur within the survey area and which are likely to be active within this area are the Commonwealth Trawl and Scalefish Hook Sectors of the Southern and Eastern Scalefish and Shark Fishery (Commonwealth). Operators within the trawl sector (CTS) are prohibited from fishing most areas of the SESSF deeper than 700 m (as well as certain other areas described in the (in force) Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016), although in the West Acquisition Area the boundary of the prohibited area extends to more than 2,500). The area of the SESSF open to trawling (CTS open area) that overlaps with the survey area and which will be ensonified by seismic sound to 3 km (Table 6.10) is 5140 km2. However, this is considered an overestimate because stakeholder information indicates that trawlers are unlikely to fish deeper than 1000 m and most trawling occurs shallower than 600 m as confirmed by the distribution of relative fishing intensity which shows only a small overlap by the activity area with areas of low to medium fishing intensity. Therefore the extent of the CTS open area to a maximum depth of 1000 m (CTS actively fished area) overlapping the survey area and ensonified by sound to 3 km is 1,355 km2, which is 0.9% of the overall CTS actively fished area (149,659 km2) and 1.9% of the CTS actively fished area west of Tasmania (71, 217 km2). Limiting the area to west of Tasmania is based on stakeholder feedback about fishing operations, and assumes operators fishing in this area do not trawl in areas east of Tasmania.

Analysis of CTS catch data for the period 2008 – 2017 (data pooled for confidentiality reasons) indicates that the main fish species caught within the Operational Area were blue grenadier (24% of total catch), silver warehou (20% of total catch) and pink ling (7% of total catch; SETFIA 2018). These are demersal species generally found in deeper waters of the continental shelf to 700 m (Table 6.10) and it is assumed that these catch proportions are also relevant to the activity area. These three species also represent three of the five species that comprise 77% of the total annual catch for the CTS (the other two being tiger flathead and eastern school whiting which are shallower water species; ABARES 2018). None of these three species are overfished or subject to overfishing, and all are captured throughout the CTS open area (ABARES 2018). Total catches of blue grenadier, silver warehou and pink ling by the CTS were 1,619, 432 and 740 tonnes, respectively during the 2017-18 fishing season (ABARES 2018). These catches are for the overall CTS open area, and if evenly distributed across this area would equate to 14.6, 3.9 and 6.7 tonnes of blue grenadier, silver warehou and pink ling, respectively, from the CTS actively fished area that is ensonified by seismic sound (base on an 0.9% overlap as described above). However, as the majority of blue grenadier catches from waters west of Tasmania occur during winter months (AFMA 2018), the proportion of the catch for this species that may be impacted by seismic noise would be much lower than the amount described above.

Effort by the Scalefish Hook Sector (SHS) occurs to 800 m depth (Helidoniotis et al. 2017). The active area of this fishery within the survey area that is ensonified by seismic sound to 3 km is is 1,261 km2, which is 0.4% of the overall actively fished area of the fishery (346,857 km2) and 1.0% of the actively fished area west of Tasmania and east of Kangaroo Island, assuming this spatial limit to fishing operations. Analysis of SHS catch data for the period 2008 – 2017 (data pooled for confidentiality reasons) indicates that the main species caught within the Operational Area were blue-eyed trevalla (50% of total catch), pink ling (28% of total catch) and ribaldo (9% of total catch; SETFIA 2018). These are demersal species generally found in deeper waters of the continental shelf (Table 6.10). None are considered to be overfished or subject to overfishing, and they are all captured throughout the area fished by the SHS (ABARES 2018). Total catches of blue-eyed trevalla, pink ling and ribaldo by the SHS were 276, 297 and 40 tonnes, respectively, during the 2017-18 fishing season (ABARES 2018). The proportion of the overall area fishery (i.e. from which this catch was obtained) that may be impacted by seismic sound is 0.4%, indicating that 1.3, 4.1 and 0.4 tonnes of these species, respectively may have been caught within the activity area (with 3 km buffer to allow for extended area of non-lethal sound impacts).

In addition to the assessment of spatial overlap described above, calculations based on vessel speed indicate that the survey vessel will only be acquiring data in water depths of 1,000 m or less for a total of 15 days over the entire survey season (inclusive of line turns), including 3.2, 5.1, 1.4, 1.3 and 3.1 days in Swaths 1 to 5, respectively. This is the maximum duration that fishable biomass would be exposed to sound levels that may cause sub-lethal effects. Sound avoidance behaviours could have a more longer term impact

on populations, particularly if animals migrate out of an area in which seismic surveys are conducted, however as described previously the potential impacts of this on catches are expected to be short term and minor.

Based on the above assessment, the survey area represents a minor portion of the area actively fished for finfish by the CTS and SHS, and limited impact on catches are expected as a consequence of survey activities (for assessment of displacement impacts refer to Section 4.3).

Table 4.10: Details of fisheries potentially occurring within the area impacted by seismic noise

Fishery	Percentage overlap with ensonified area	Target depth range species	Potential impact?
Southern and Eastern Scalefish and Shark Fishery – Commonwealth Trawl Sector	0.9% of the entire CTR actively fished area (as permitted by regulation to 1000 m depth) and 1.9% of the CTR actively fished area west of Tasmania	Blue grenadier: 200–700 m Tiger flathead: 10–400 m Silver warehou: 50–600 m Pink ling: 40–700 m	Minor –amount of actively fished area is 5% (assuming fishers only fish west of Tasmania). There is only small overlap with areas of low to medium relative fishing intensity
Southern and Eastern Scalefish and Shark Fishery – Shark Gillnet and Shark Hook Sectors	Actively fished area is outside of survey area (maximum fished depths 155-183 m, based on the SETFIA report	Gummy shark: 80–350 m School shark: 0–550 m Australasian snapper: 0–220 m	No direct impact to actively fished areas as maximum depths are outside the survey area (vessels are restricted to <183 m, (SETFIA 2018). Possible impact to very small area (0.1% of fished area) within 3 km of inshore boundary of survey area – predicted TTS range is up to 3 km, therefore may overlap the depth range of active fishery.
Southern and Eastern Scalefish and Shark Fishery - Scalefish Hook Sector	0.4% of the entire SHS actively fished area (to 800 m depth) and 1.0% of the SHS actively fished area west of Tasmania and east of Kangaroo Island	Blue-eye trevalla: 40–1500 m Pink ling: 40–700 m Blue grenadier: 200–700 m Tiger flathead: 10–400 m Silver warehou: 27–650 m	Possible - however catches are at historically low levels and stakeholder feedback suggests minor overlap with the ensonified area.
Small Pelagic Fishery	Based on the biological depth ranges of key species, available catch and effort data described in the SETFIA report, no overlap with actively fished areas	Jack mackerel: 10–460 m Redbait: 86–500 m Blue mackerel: 0–200 m	Unlikely – <5 vessels fished the Operational Area during 2008–2017, and so catch, effort and value of the fishery in the area cannot be reported. Most significant catch in this fishery is currently taken by a vessel that fishes exclusively off NSW (SETFIA 2018)
Ocean (General) Fishery (VIC) Bait (General) Fishery (VIC)		Australasian snapper: 0–200 m Crab, worms, shellfish – inland waters/nearshore	No impact – due to key species biological depth restrictions
Marine Scalefish Fishery (SA)		Australasian snapper: 0–200 m King George whiting: 2–200 m	No impact – due to key species biological depth restrictions
Scalefish Fishery (TAS)		Tiger flathead: 10–400 m Silver warehou: 27–650 m Australian sardine: 0–200 m	No impact – catch and effort data from 2011 to 2017 show no activity on western side of Tasmania or King Island.

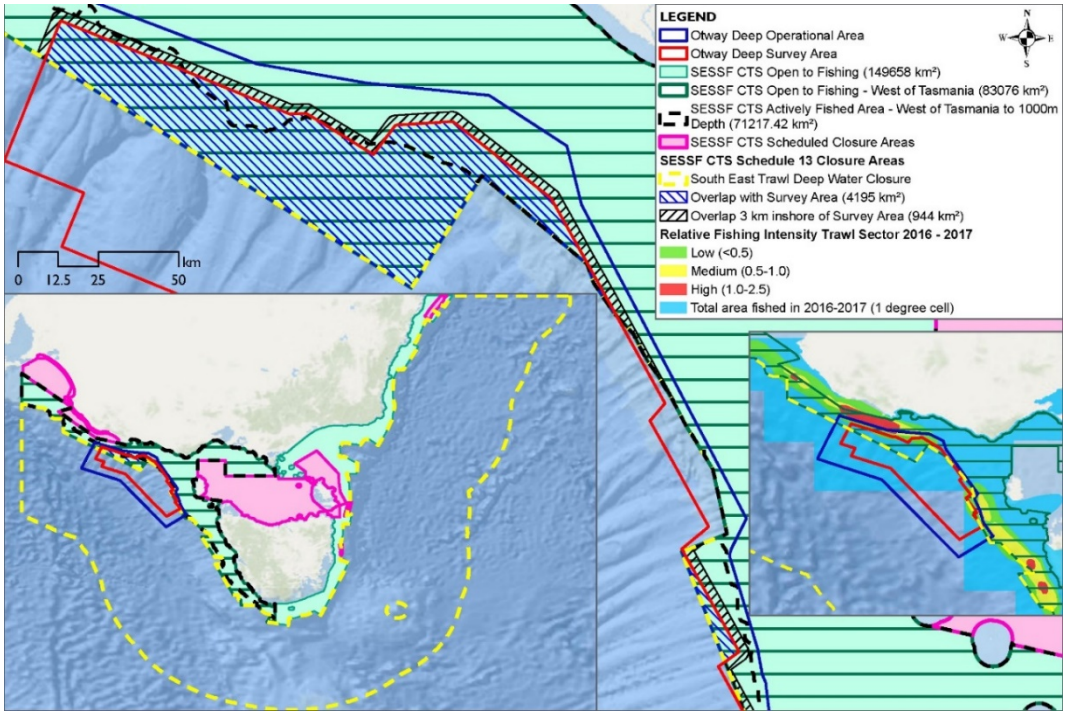

Figure 4.5: Commonwealth trawl sector of the SESSF (fisheries data source: Helidoniotis et al. 2017)

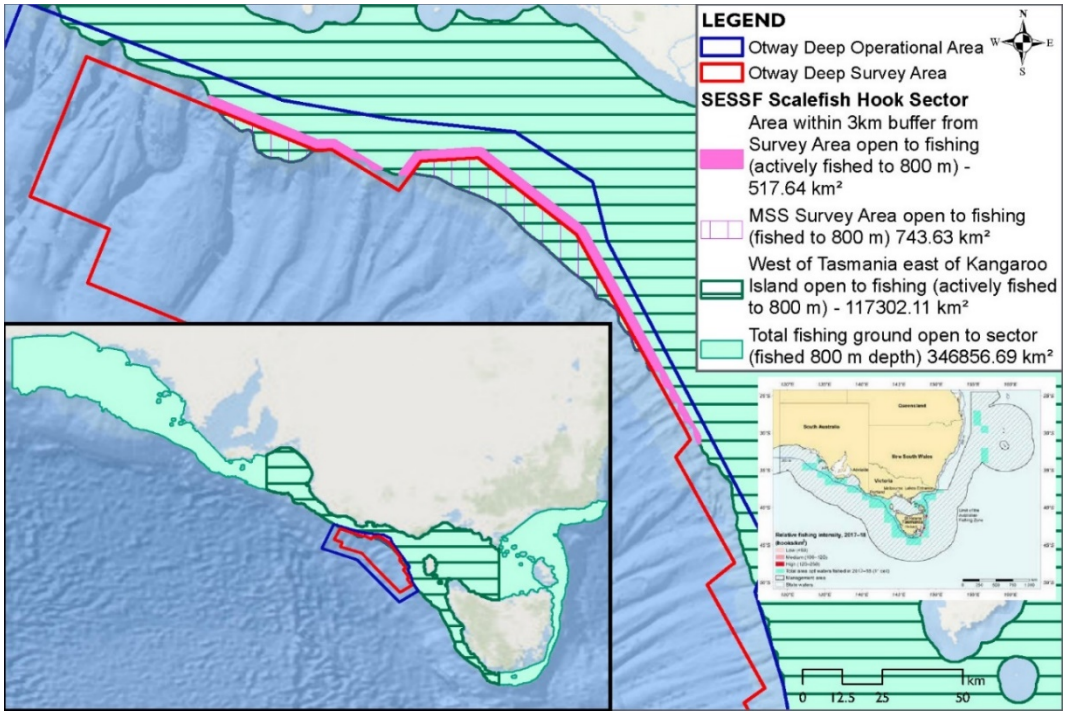

Figure 4.6: Commonwealth scalefish and hook sector of the SESSF (fisheries data source: Helidoniotis et al. 2017)

4.1.3.4 Impacts to marine turtles

Marine turtles appear to use acoustic cues in perception of their local and distant environment on their long (sometimes thousands of kilometres) migrations between nesting and foraging sites (Swan et al. 1994). Most studies looking at the effect of seismic noise on marine turtles have focused on behavioural changes and responses as physiological damages are more difficult to observe in living animals. Studies carried out by Lenhardt (1994) showed that marine turtles increased their movements after seismic noise emissions and

did not return to the depth at which they usually rested. De Ruiter and Doukara (2010) observed turtles during active seismic operations and recorded startle responses (rapid dive) to the seismic emissions; 51% of turtles dived at or before their closest point of approach to a seismic source. However, these authors could not distinguish the stimulus source of the startle response, as they did not perform a control without the seismic stimulus (De Ruiter and Doukara 2010). McCauley et al. (2000) conducted controlled experiments on a caged loggerhead turtle and a caged green turtle and exposure to noises from seismic sources louder than 166 dB re 1 µPa SPL (RMS) increased their swimming activity.

Underwater sound modelling carried out for the Otway Deep MSS for an airgun array source level of 3,475 in3 predicted distances to received sound levels compared with peer reviewed marine turtle guideline levels in Table 4.11. The sound modelling predicted mortality to potential mortal injury up to 110 to 166 m from the source. Strong avoidance behaviour is predicted up to 4.3 km from the source. Such behavioural changes are expected to only last for the duration of a survey pass with normal behaviour anticipated to resume when the vessel has moved this distance or more away along the seismic sail line. There are no BIAs or areas known to be important for turtle life history stages in the Activity EMBA. Any disturbance will be limited to avoidance response followed by rapid resumption of normal activity. Given that there are no nesting areas or known foraging habitats within or in the vicinity of the survey area, there are no predicted effects to populations.

Table 4.11: Summary of modelled impact ranges for marine turtles

Guideline description	Guideline level	Impact range (r_{max})
Mortality and potential mortal injury (Popper et al. (2014)	>207 dB peak SPL	110-166 m
Behaviour: strong avoidance (McCauley et al. 2000)	>166 dB peak SPL	4.3 km

4.1.3.5 Impacts to cetaceans

Marine mammals use sound for foraging, orientation, communication, navigation, echolocation of prey and predator avoidance (Richardson et al. 1995) and therefore are sensitive to underwater noise. High levels of anthropogenic underwater sound can potentially have negative impacts; ranging from changes in their acoustic communication, displacing them from an area, and in more severe cases causing physical injury or mortality (Richardson et al. 1995).

High levels of noise exposure can also cause an instantaneous auditory injury resulting in a permanent threshold shift (PTS) that persists once sound exposure has ceased. PTS may also result from prolonged exposure at lower levels. Hearing loss may be considered permanent if hearing does not return to normal after several weeks. Lower noise levels or shorter exposures to noise have the potential to cause a temporary threshold shift (TTS) where animals would experience temporary auditory injury, and from which they would recover fully, particularly as they move away from the source.

Behavioural responses to low frequency acoustic sound in baleen whales range from tolerance at low–moderate acoustic levels (McCauley et al. 2000) to graduated behavioural responses including shifts in respiratory and diving patterns (McCauley 1994) at higher levels. It has been observed that the behaviour of cetaceans to differing sound levels depends on their activity at the time of exposure and is variable between and within species (Richardson et al. 1995). Cetaceans tend to be less responsive to sound when migrating or feeding than when suckling, resting or socialising. Behavioural responses to low frequency sounds like seismic airgun discharges include:

- Minor to moderate behavioural responses have been observed in migrating (Mccauley et al. 1998) and in socialising (Mccauley et al. 2000) humpbacks at received SPL of between 140 and 180 db re 1 µpa
- A startle response when a resting or slow-moving whale rapidly moves away from the sound source or changes surface – dive – respiration behaviour
- Avoidance by a course or speed change to maintain a minimum buffer distance to the sound source
- Swimming directly to the source up to a stand-off point
- Changes to vocalisation patterns.

The key marine mammal species within the Otway Deep survey area that may be affected by underwater noise from seismic operations have been classed into the functional hearing groups as follows:

- Low-frequency cetaceans (baleen whales): limited to migrating individuals for humpback whales, and potential presence of pygmy blue, Bryde's and Antarctic minke whales
- Mid-frequency cetaceans: limited to transiting individuals for dolphins, sperm and killer whales
- High-frequency cetaceans: *Kogia* sp. (dwarf sperm whale).

Underwater sound modelling carried out for the Otway Deep MSS for an airgun array source level of 3,475 in3 predicted distances to received sound levels compared with peer reviewed cetacean guideline levels in Table 4.12.

Table 4.12: Summary of modelled impact ranges for cetaceans

Hearing group/animal type	Threshold	Predicted impact distance (R_{max}) (km)						
		Site 1	Site 2	Site 3	Site 6	Site 7	Site 8	Site 11
Single-shot (per-pulse)								
Low-frequency cetaceans (PTS)	219 (dB re 1 µPa)*	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Low-frequency cetaceans (TTS)	213 (dB re 1 µPa)*	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Mid-frequency cetaceans (PTS)	230 (dB re 1 µPa)*	ND	ND	ND	ND	ND	ND	ND
Mid-frequency cetaceans (TTS)	224 (dB re 1 µPa)*	ND	ND	ND	ND	ND	ND	ND
High-frequency cetaceans (PTS)	202 (dB re 1 µPa)*	0.19	0.2	0.26	0.20	0.20	0.20	0.20
High-frequency cetaceans (TTS)	196 (dB re 1 µPa)*	0.64	0.4	0.60	0.41	0.66	0.40	0.41
Behavioural disturbance (all groups)	160 (dB re 1 µPa)**	6.88	7.71	8.39	8.05	6.96	6.31	8.64
Behavioural disturbance (southern right whale cow/calf pairs)	140 (dB re 1 µPa)***	15	<15	<15	<15	<15	<15	<15
Cumulative exposure (weighted SEL_{24h})								
Low-frequency cetaceans (PTS)	183 (dB re 1 $\mu Pa^2.s$)*	0.42 km (based on cumulative lines scenario)						
Low-frequency cetaceans (TTS)	168 (dB re 1 $\mu Pa^2.s$)*	10 to 48.15 km (based on cumulative lines scenario)						
Mid-frequency cetaceans (PTS)	185 (dB re 1 $\mu Pa^2.s$)*	ND						
Mid-frequency cetaceans (TTS)	170 (dB re 1 $\mu Pa^2.s$)*	ND						
High-frequency cetaceans (PTS)	155 (dB re 1 $\mu Pa^2.s$)*	0.01 km (based on cumulative lines scenario)						
High-frequency cetaceans (TTS)	140 (dB re 1 $\mu Pa^2.s$)*	0.58 km (based on cumulative lines scenario)						

Note: * (NOAA 2018), ** (NMFS 2013); *** (Southall et al. 2007); ND = threshold not reached.

The sound modelling predicted PTS up to a maximum distance of 420 m of the source for low-frequency cetaceans and up to 200 m for high-frequency cetaceans based on the worst case cumulative 24-hour scenario. The modelling does not predict any PTS for mid-frequency cetaceans. However, it is considered highly unlikely that a cetacean would be exposed to these levels due to the implementation of a shut-down buffer zone of 500 m as required under EPBC Policy Statement 2.1. It is therefore unlikely that an animal will be within this range of the seismic vessel at the commencement of the survey as soft-start procedures would encourage the animal to move away.

Received levels for TTS effects are predicted to be reached within a maximum distance of 50 m of the source in low-frequency cetaceans and 50 km from the source in the offshore direction and 10 km in the inshore and along shore directions.

Received levels for TTS in high-frequency cetaceans are predicted to be reached within a maximum distance of 660 m of the source. The modelling does not predict any TTS for mid-frequency cetaceans. Again, it is unlikely that a cetacean would be exposed to TTS levels as the source would be either shut-down or powered down to its lowest setting. The Otway Deep MSS will adopt a larger low-power zone of 2 km

around the seismic vessel, in accordance with the requirements of EPBC Policy Statement 2.1 which requires the low-power zone to be increased to 2 km if modelling predicts that 160 dB re 1µPa2.s is reached within 1 km for 95% of shots.

Behavioural disturbance for all marine fauna groups (except southern right whale cow/calves) is predicted up to a maximum distance of 9 km in all directions based on the single shot (per-pulse modelling results).

4.1.3.5.1 Southern right whale BIA

The southern right whale BIA for aggregation/calving /breeding lies approximately 11.4 km north of the survey area, where one small established aggregation area and three emerging aggregation areas are located along the VIC coastline. Southern right whales migrate to these areas in May and stay until September/October, and generally stay within 2 km of the coast in shallow waters of 10 m during this time. Sightings records of cow/calf pairs from 2001 to 2011 as part of the South-eastern Southern Right Whale Photo-identification Catalogue SEA SRW PC) show animals are indeed observed in shallow waters in the BI). Annual sightings summaries for the SEA SRW PC for 2013 to 2014 indicate sightings made in October are rare and can often only amount to a single female (and sometimes calf).

It is possible that whales within this area that may be calving (and calves themselves) would be more sensitive to anthropogenic noise sources due to the confined location of the BIA, i.e. less likely to swim away in the event of disturbance. This sensitivity is also anticipated for cow/calf pairs entering or leaving the BIA. On leaving the BIA southern right whales are not expected to forage in the immediate waters outside the aggregation area or within Australian waters as their feeding grounds are further south (Pirzl 2008, DSEWPaC 2012)

To address this increased sensitivity, a more precautionary disturbance threshold was used to interrogate the sound modelling, which predicted that behavioural effects may be possible within 15 km of the seismic source. This behavioural disturbance distance overlaps a small part of the BIA on its offshore closest to the survey area. Therefore it is possible that later leaving cow/calf pairs leaving the BIA in October could be disturbed by seismic sound levels in the parts of the survey that are located 15 km away from the edge of the BIA. A buffer distance of 15 km has been added onto the edge of the southern right whale BIA to show the extent of the survey area seismic operations would produce sound levels within the BIA that exceed the behavioural disturbance threshold.

It is possible that southern right whales (and their calves) could be present in the BIA for distribution and migration when leaving the aggregation BIA. At the Warrnambool aggregation location, the month of September generally has the highest percentage of whales leaving the area. Whales leaving at the end of the season in October could be exposed to received levels that elicit TTS and behavioural disturbance effects, however southern rights movements generally keep to shallower waters due to the presence of calves. This is supported by aerial surveys conducted by Gill et al. (2015) between Nov to April (2002 to 2013), during which there were no southern right whales observed away from the coast.

In addition, the survey vessel would start acquiring data along the inshore survey lines and move offshore, thereby increasing the distance between the BIA and any whales leaving that area. The seismic vessel will acquire data along sail lines within swaths, taking between 6.5 and 16 hours to complete a line. Only a small number of lines within each of the survey swaths overlap the southern right whale 15 km buffer around the BIA. The survey vessel would require a total of 2.5 days of the total 120-day survey duration to complete lines/line turns within the overlap with the buffer; meaning that any individuals leaving the BIA and heading directly offshore could be exposed to levels eliciting a behavioural response. However, the duration of ensonification would be intermittent allowing periods of recovery as the vessel travels southeast along a sail line (for 6.5 to 16 hours), turns (4-5 hours) and then travels north-westwards (6.5 to 16 hours) along a sail line (approx. 8 to 12 km away from the preceding line) before returning to the shallower parts of the survey area.

Underwater noise impacts resulting in effects in southern right whales are predicted to be localised, limited to one or only a few individuals, intermittent, very short-term (October only) and recoverable. No impacts at a population level are predicted.

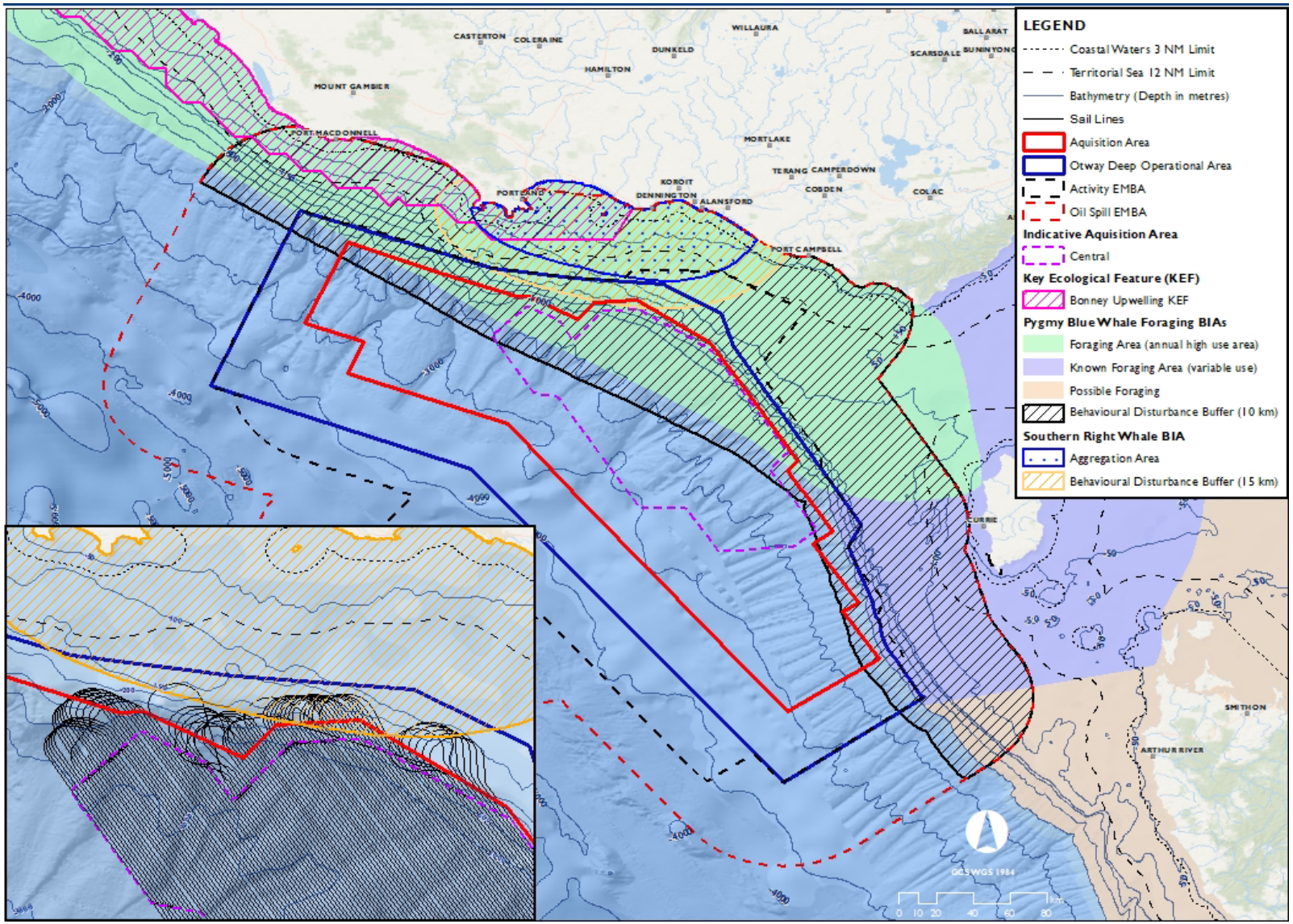

Figure 4.7: Behavioural disturbance buffers for cetacean BIAs

4.1.3.5.2 Pygmy blue whale foraging BIA

The survey area and the ensonified area predicted to cause TTS and behavioural disturbance overlaps the 'annual high use' foraging BIA for pygmy blue whale, as well as the distribution/migration BIA for this species. Note that the distribution/migration BIA is spatially contained within the foraging BIA boundary. The foraging BIA is related to known aggregations of pygmy blue whales that feed in the regional upwelling system during November to May between the GAB and the Bass Strait. The upwelling area of importance closes to the survey area is the Bonney Coast Upwelling KEF located 24.5 km away to the north. Pygmy blue whales generally start in the in the eastern GAB waters at the beginning of the upwelling season and move through SA waters into VIC waters during January to April, peaking in February (Gill et al. 2011). There is therefore temporal overlap of the Otway Deep MSS with the foraging BIA for pygmy blue whales during Nov to Jan. There will be no temporal or spatial overlap during the month of February as Spectrum has committed to not carry out seismic operations during this month within the foraging BIA and 10 km noise buffer distance from the edge of the BIA.

Distribution of blue whales in the upwelling area has been shown by Gill et al.et al. (2011) to be closely related to sea surface temperature (SST). Aerial surveys conducted over 2002 to 2013 by Gill et al. (2011) determined that densities of blue whales in the eastern zone upwelling area peaked in February which coincided with peak upwelling intensity and primary productivity (sea surface chlorophyll). However, it is also evident from the aerial surveys carried out by Gill that there are relatively high numbers of pygmy blue whales present December and January. This is largely due to the potential for upwelling to begin a little earlier or a little later in the season. Due to the inherent uncertainty at being able to predict the timing and location of upwelling events and the potential for inter-annual variability in pygmy blue whale abundance, Spectrum have taking a precautionary approach to the timing of the arrival of pygmy blue whales to the foraging BIA in the Otway basin and assumes that both December and January may be considered as high usage months.

Data from aerial surveys conducted over 2002 to 2013 by Gill et al. (2011) was used to estimate densities of blue whales in the eastern zone upwelling area of the Bonney Coast Upwelling, which includes the Otway Deep survey area. The density distribution maps show the movement of pygmy blue whales from the eastern Great Australian Bight (GAB) or 'central' zone and into the Otway Basin ('eastern' zone). Densities of pygmy blue whales are closely correlated with the Bonney Coast upwelling area and Key Ecological Feature (KEF), with the highest densities occurring in <200 m water depth across the months that the Otway Deep MSS is proposed to occur (i.e. November to February). Low densities of pygmy blue whales occur in >200 m water depth. However, given the spatial extent of the pygmy blue whale foraging BIA covering waters >200 m, and the uncertainty of the spatial and temporal extents of the upwelling events, it is assumed likely that pygmy blue whales could be present foraging across their foraging BIA.

The survey vessel would start acquiring data along the inshore survey lines and move offshore, thereby increasing the distance between the higher density presence of pygmy blue whales in the Bonney Coast Upwelling KEF.

Figure 4.8 shows the possible overlap of the seismic vessel with the pygmy blue whale foraging BIA and additional noise buffer of 10 km (based on TTS for cumulative (24 hour) exposure). This illustration outlines the month by month schedule for the location the seismic vessel could be for the 4-month survey program – the timing is indicative, and the exact timing will depend on a number of factors (such as survey area extent, start date of survey, weather and if additional time required to manage stakeholder interactions and/or whale mitigation requirements). However, although this is an indicative timing, Figure 4.8 does importantly illustrate that although the survey lines have some overlap with the foraging BIA and/or 10 km noise buffer, the seismic vessel will not be operating in these areas continuously in any given 24-hour period (based on the vessel requiring 6.5 to 16 hours for each survey line). The seismic vessel will begin acquisition at the start of the survey (i.e. during month 1) in the north-east of the survey area acquiring the inboard lines first, and then working its way outboard (offshore). Ensonification of the BIA and buffer when the survey is operating within the overlap area will therefore be intermittent during a 24-hour period, with periods for recovery of between 8 and 17 hours within this timeframe.

Spectrum have calculated the number of sail lines within the overlap of the foraging BIA plus 10 km buffer and each of the indicative survey areas – Central, West and South Acquisition Areas. Sail lines would be acquired within each of the three Acquisition Areas within a defined number of survey swaths. The duration that the seismic vessel would acquire seismic data within the three areas is described below and are the maximum durations that pygmy blue whales would be exposed to sound levels that may cause TTS or behavioural effects:

- Central area– seismic vessel would require a total of 45 days of the total 120-day survey duration to complete lines (including line turns) within the overlap with the foraging BIA and 10 km buffer.

- West area – seismic vessel would require a total of 20 days of the total 120-day survey duration to complete lines (including line turns) within the overlap with the foraging BIA and 10 km buffer.

- South area – seismic vessel would require a total of 7 days of the total 120-day survey duration to complete lines (including line turns) within the overlap with the foraging BIA and 10 km buffer.

Any whales foraging in the foraging BIA plus buffer within 10 km of the source could be exposed to levels eliciting a behavioural response. However, the duration of ensonification would be intermittent allowing periods of recovery as the vessel travels southeast along a sail line (for 6.5 to 16 hours) and outside of the foraging BIA buffer, before turning (4-5 hours) and then traveling north-westwards (6.5 to 16 hours) along a sail line (approx. 8 to 12 km away from the preceding line) before re-entering the foraging BIA and buffer.

Although the underwater sound modelling has predicted TTS effects out to 10 km from the source, this is based on a cumulative received dose over a period of 24 hours. It is extremely unlikely that an animal would remain within 10 km of the vessel for 24 hours to receive this dose and would most likely move away to another part of the large area that encompasses the foraging BIA. However, the level of acceptable impact for pygmy blue whales is for no disturbance or displacement of whales from their foraging BIA. To this end, Spectrum has taken a precautionary approach in the implementation of control measures for the cetacean monitoring vessel (chase vessel) – refer to control measures and environmental performance standards in Section 4.1.4.3.

Underwater noise impacts resulting in TTS and/or behavioural effects to pygmy blue will be limited to within 10 km of the seismic source and short-term (survey duration of 120 days) and recoverable. There will be no injury to pygmy blue whales based on predicted modelled received levels and the implementation of shut-down procedures within 500 m of the seismic vessel. It is possible that without the implementation of additional control measures that the survey could disturb and/or displace whales from the foraging BIA. However, the foraging BIA covers a large spatial extent and even if that were to occur, it would be only be limited to individuals. No impacts at a population level are predicted.

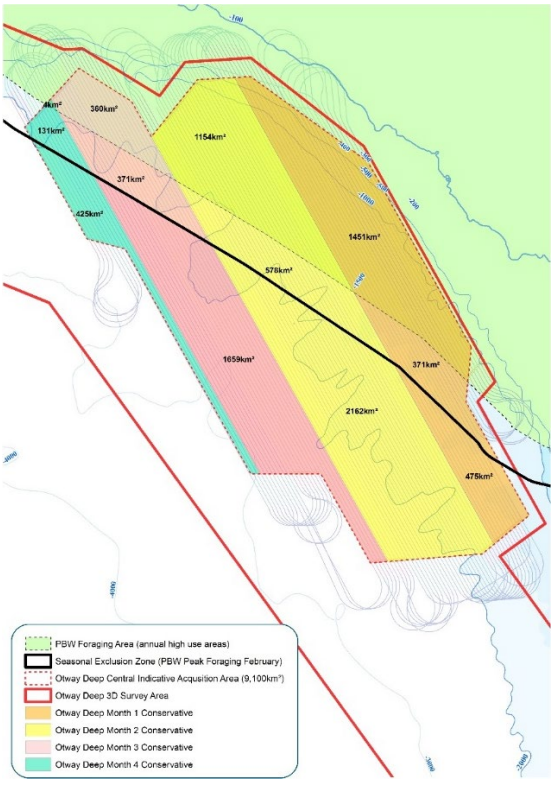

Figure 4.8: Indicative vessel timing overlap with the pygmy blue whale foraging for the four-month (120 day) survey program for the Otway deep MSS

4.1.3.5.3 Other cetaceans

Other low-frequency cetaceans that have been recorded/observed in the Otway basin during aerial surveys include species opportunistically feeding in the area during upwelling periods, and include fin, sei, humpback and Antarctic minke whales. Apparently low abundances of these (and other) species implies that although cetaceans probably aggregate to forage in this productive upwelling system, it may not be a key feeding area for many, with the exception of pygmy blue whales (Gill et al. 2015). No impacts at a population level are predicted for these species.

Mid-frequency cetaceans including sperm whales (Physeter sp.), killer whales and dolphins, may be present in the region, however there are no known BIAs or important areas for feeding, migration, resting, breeding in or close to the Activity EMBA. Sound modelling predictions did not reach levels that could cause PTS (injury) or TTS (disturbance) for mid-frequency cetaceans. Behavioural disturbance may occur up to 9 km, however localised, short-term and recoverable. No impacts at a population level are predicted. Seismic operators and MFOs on seismic vessels regularly see dolphins and other small-toothed whales in the vicinity of seismic surveys. In general, dolphins avoid operating seismic vessels (Stone and Tasker 2006), and in most cases, the avoidance radii for dolphins are small (1 km or less), with some individuals showing no apparent avoidance (Holst et al. 2006; Moulton and Miller 2005; Stone 2003; Weir 2008).

Sperm whales are closely associated with foraging in sub-marine canyon systems. Both Physeter sp. (mid-frequency cetacean) and Kogia sp. (high-frequency cetacean) could be foraging in canyons that run through the survey area (includes the West Tasmanian Canyons KEF), however sperm whale observations from GAB studies do not show this area to be a heavily used area. Also predictive habitat modelling does not identify the area west of King Island as having a high probability of sperm whale habitat. Underwater noise impacts resulting in behavioural effects to mid-frequency and high-frequency whales will be limited to within 9 km of the seismic source and short-term (survey duration of 120 days) and recoverable. No impacts at a population level are predicted.

4.1.3.6 Impacts to pinnipeds

The closest breeding colonies of the Australian fur seal are at Lady Julia Percy Island (37 km north of the survey area) and Cape Bridgewater (27 km north). These sites are too distance from the seismic survey for any effects to occur, however it is possible that adult fur seals could forage up to 150 m water depths.

The Australian fur seal belongs to the family Otariidae, which are less sensitive to low frequency sounds (<1 kHz) than to higher frequencies (>1 kHz). Underwater sound modelling was carried out for both single shot sites and for a 24-hour cumulative exposure scenario. NOAA (2016) thresholds for PTS and TTS were not reached in the modelling and so no injury or temporary disturbance effects are predicted for fur seals. In addition, cumulative TTS effects are predicted within 10 m of the source.

Underwater noise impacts resulting in behavioural effects to the Australian fur seal will be limited to 750 m probable or <9 km (unlikely) of the seismic source and short-term (survey duration of 120 days) and recoverable. No impacts to breeding success or at a population level are predicted.

4.1.3.7 Impacts to protected area values and management

Spectrum has undertaken the impact assessment in accordance with the management strategies and objectives of the South-east Marine Reserves Network Management Plan and consistent with Australia's IUCN Principles. Protected areas and their conservation values that could be affected by seismic sound from the Otway Deep MSS are summarised in Table 4.13. There are no listed cultural heritage properties in the offshore area nor has there been any objection to the from cultural heritage stakeholders during consultation.

Table 4.13: Australian Marine Parks within the EMBA

Protected area	Conservation values	Relevant IUCN category	Impacts from survey
Zeehan Marine Park	• Examples of ecosystems, habitats and communities associated with the Tasmania Province, the West Tasmania Transition and the Western Bass Strait Shelf Transition and associated with the 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 areas for: black-browed, wandering and shy albatrosses, and great-winged and cape petrels.	Multiple Use zone (Cat VI) – provides for a wide range of sustainable activities by allowing those that do not significantly impact on benthic (seafloor) habitats or have an unacceptable impact on the values of the area. Special Purpose zone (Cat VI) – provides for a wide range of activities provided they will not have an unacceptable impact on the values of the area. This zone allows for limited access to mining and low-level extractive activities.	The impact assessment for environmental receptors provided throughout this section demonstrates that the survey will not have a significant impact on benthic impacts in the region or on the values of the area. Historical seismic surveys in the Otway Basin have not reduced biodiversity or fauna abundance in the region. The South-east Commonwealth Marine Reserves Network Management Plan (DNP 2013) states that mining operations (including seismic surveys) are approved to be carried out in Marine Park Multiple Use and Special Use zones under section 359B of the EPBC Act, subject to the approval of an EP, indicating that the DoEE considers that seismic surveys pose no significant threat to the conservation values of these Marine Parks.
Bonney Coast Upwelling KEF	• Primary production/planktonic species • Pygmy blue whale foraging area • Other whale species intermittent/opportunistic feeding • Little penguins/Australian fur seals (feeding on baitfish)	N/A	No management objectives set, refer to assessments in: • Section 4.1.3.1 (plankton) • Section 4.1.3.5 (high use pygmy blue whale foraging area and other whales) • Section 4.1.3.6 (Australian fur seal) • Section 4.1.3.3 (baitfish)
West Tasmania Canyons KEF	• Localised upwelling/biodiversity hotspots • Sponges (200 – 350 m depth) associated with fish abundance	N/A	No management objectives set, refer to assessments in: • Section 4.1.3.1 (plankton) • Section 4.1.3.5 (possible sperm whale foraging, pygmy blue foraging) • There are no expected impacts on sponge diversity and abundance on the KEF canyon heads from seismic sound.

4.1.3.8 Cumulative impacts

Cumulative impacts have been assessed in terms of the key receptors within the Otway Deep Activity EMBA, namely:

- Zeehan Marine Park
- Bonney Coast Upwelling KEF and West Tasmanian Canyons KEF
- Pygmy blue whale BIA (foraging and distribution/migration) and Southern right whale BIA (distribution/migration and aggregation/calving)
- White shark BIA (distribution)
- Commercial fish species – target species for the Commonwealth trawl sector, shark and scalefish line and hook sector, southern rock lobster, giant crab and squid.

4.1.3.8.1 Concurrent surveys

On investigation of approved surveys announced on the NOPSEMA website, there are no other seismic surveys planned (EP submitted or accepted) that overlap with the Otway Deep survey or Operational Areas. As the scheduling for Otway Deep is not yet finalised, it is not yet possible to determine which other seismic surveys will be in progress during the Otway Deep.

The NOPSEMA website will continue to be monitored for newly accepted EPs for marine seismic surveys which could contribute to cumulative noise in the survey area. If a survey is permitted within 40 km of the Otway Deep survey area, and scheduling for both surveys may overlap, the relevant titleholder will be contacted, and arrangements made to ensure that the potential cumulative impacts will be reduced to ALARP.

Given the very low probability of two seismic surveys occurring simultaneously and the controls that will be implemented to establish and maintain communications prior to and during the survey to ensure such simultaneous activities would maintain an adequate separation distance, there is very little risk of cumulative impacts to marine receptors.

4.1.3.8.2 Sequential surveys

Cumulative impacts can occur when the timing between activities is less than the recovery rate of any potential impacts to receptors. The US National Marine Fisheries Service (NMFS) applies a “resetting” of SELcum after 12 hours of non-exposure (Stadler and Woodbury 2009). As it will be 12-24 hours before an adjacent area (distance away based on the size of the array spread) is acquired, negligible cumulative impacts resulting from consecutive sail-lines is expected.

There have been no previous seismic surveys over the Otway Deep survey area since 2015. Due to the period of time between surveys it is expected that there is no lasting impact to the Otway Deep survey area as a result of previous seismic surveys (i.e. full recovery has occurred); and therefore, there will be no sequential (or additive) effect as a result of the Otway Deep MSS.

Spectrum propose to carry out the surveys over two seasons, however the same area would not be surveyed again from one season to the next, and the potential for cumulative effects would be limited to potential overlaps in areas of ensonification.

4.1.4 Demonstration of ALARP

The impacts to marine fauna from anthropogenic noise (seismic) are relatively well understood for some marine fauna groups (e.g. marine mammals), with the exception of marine mammals carrying out sensitive behavioural processes (e.g. calving), and less understood for others e.g. invertebrates, plankton and fish. Application of recognised good practice control measures alone is not considered appropriate to manage the potential impacts. This assessment also considers the environmental impact to the location specific environmental values and sensitivities of the Activity EMBA (e.g. likely encounters with foraging pygmy blue whales). In addition, due to the timing and location of the survey area, a precautionary approach has been applied to augment decision making further where uncertainty continues to exist.

Spectrum is committed to ensuring continual risk reduction and identifying if additional control measures may be applied that are not disproportionate to the sacrifice (e.g. cost) of implementation. Where the cost of implementing the additional control measures is disproportionate to the benefit gained, they have not been adopted. Spectrum has applied a precautionary approach in managing potential encounters with pygmy blue whale aggregations with the application of additional control measures for reducing potential impacts from underwater sound from seismic operations. These controls include measures for relocation of the vessel in the event >15 whales are present in the observation zone during the pre-start observation check, precautionary shut-down procedures, adaptive management including PAM and monitoring of upwelling events. These are described in detail below (see Environmental Performance Outcomes and Standards Section 4.1.4.3).

Spectrum considers the adopted controls to be appropriate in reducing the environmental impacts associated with underwater sound from seismic operations on marine fauna to ALARP. There are no other controls measures that may practicably or feasibly be adopted to further reduce the impacts without disproportionate costs compared to the benefit of the potential impact reduction.

4.1.4.1 Cetacean monitoring systems

4.1.4.1.1 Passive acoustic monitoring system

Spectrum will utilise PAM as a control to mitigate impacts to pygmy blue whales that might be present in the Operational Area during operations.

The effectiveness and accuracy of PAM to detect and locate positions of marine mammals during seismic operations is well established (Todd et al. 2015; Sousa-Lima et al. 2013).

PAM operators will work closely with the visual observation team (MFOs) to identify and locate vocalising marine mammals to determine if they are within the shutdown or low-power zones.

If a PAM operator detects a marine mammal, they will notify the Lead MFO or SEA who will assess the location of the individual relative to the precaution (observation, low-power, shut-down) zones. If the marine mammal is positioned within these zones, the Lead MFO or SEA will immediately notify the seismic observers, who will immediately initiate the appropriate mitigation responses.

The combination of PAM (and PAMGUARD software) with visual observations will provide an effective control of operations and ensure that the survey meets the requirements of the EP in ensuring appropriate mitigation actions are undertaken when marine mammals are detected within the specified mitigation zones. These methods represent international best practice for seismic surveys.

4.1.4.1.2 Thermal imaging camera system

Spectrum is investigating emerging technologies for real-time detection/monitoring of whales during periods of low visibility and at night. A dual camera thermal imaging system will be implemented on the chase vessel to observe cetaceans during periods of low visibility and at night time for the Otway Deep survey. This technology can be effective at detecting large whales at distances of a few kilometres, provided that the animal is available to be detected (i.e. at the surface), ideal conditions (i.e. no fog, little wind, low sea state) and the camera system is mounted sufficiently high (Verfus et al. 2017). In these optimal conditions, medium sized whales will be detectable reasonably well in up to 1.5 km, and larger whales with reliable detection ranges at 2 km. Reliable detection of small whales and dolphins should be possible up to 500 m, and pinnipeds at < 500 m (Verfus et al. 2017). The selected system will facilitate 24-hour real-time monitoring of marine mammals, consisting of a dual visual / infrared system with HD and thermal imaging cameras, enabling both day and night monitoring up to 360˚ coverage. Distance estimation software incorporated into the system to provide objective and recordable distance estimation on the sea surface and an overlay of the EPBC Policy Statement 2.1 precautionary zones).

4.1.4.2 Cost benefit analysis

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). Control measures that were rejected as cost outweighing the benefit or not practicable are listed below.

Control measures rejected	Cost benefit analysis	Impact reduction	Control adopted
ALARP assessment technique – precautionary			
Additional control measures for pygmy blue whales – to be implemented during November, December and January			
Aerial surveys to observe the survey area and provide vessel with locations of any observed cetaceans	Aerial surveys were previously conducted for Origin in 2011 for the Bellerive seismic survey and are an effective tool for monitoring cetaceans. However, there are significant limitations associated with aerial surveys, such as limited aircraft endurance (due to size of survey area and distance offshore), ineffective at night and considerable additional safety risk and cost in using manned aircraft. Costs outweigh benefits.	Yes	No

Control measures rejected	Cost benefit analysis	Impact reduction	Control adopted
Additional control measures for southern right whales – to be implemented during October			
No seismic activity during October within 15 km of the southern right whale BIA	Limited numbers of whales recorded within the BIA or leaving the BIA in October based on monitoring data collected since 2002. In addition, the overlap of the survey area with the 15 km BIA buffer is small and means that the seismic vessel will be within this area for approx. 2.5 days. A dedicated chase vessel will monitor ahead of the seismic vessel to detect SRWs early. Cost outweighs benefit.	Limited reduction	No
Passive acoustic monitoring / thermal imaging systems – to be implemented October to February			
Other control measures			
Reduce survey acquisition by increasing streamer spread or number of streamers.	Spectrum has already committed to using a wide-tow spread meaning adjacent lines are spaced 750 m apart, which already significantly reduces the survey duration by up to 30% Cost outweighs benefit.	Small reduction	No
Chase vessel control measures – shut-downs			
Residual Impact			
Residual impact	**Consequence**	**Likelihood**	**Risk ranking**
	Negligible – plankton	Almost certain – plankton	Low – plankton
	Minor – invertebrates	Unlikely – invertebrates	Low – invertebrates
	Minor – lobster/crab/squid fishers	Unlikely – lobster/ crab/squid fishers	Low – lobster/crab/ squid fishers
	Minor – fish	Unlikely – fish	low – fish
	Minor – fisheries	Unlikely – fisheries	Low – fisheries
	Negligible – turtles	Remote – turtles	Low – turtles
	Moderate – cetaceans	Unlikely – cetaceans	Medium – cetaceans
	Negligible – pinnipeds	Unlikely – pinnipeds	Low – pinnipeds
	Minor – protected areas	Unlikely – protected areas	Low – protected areas

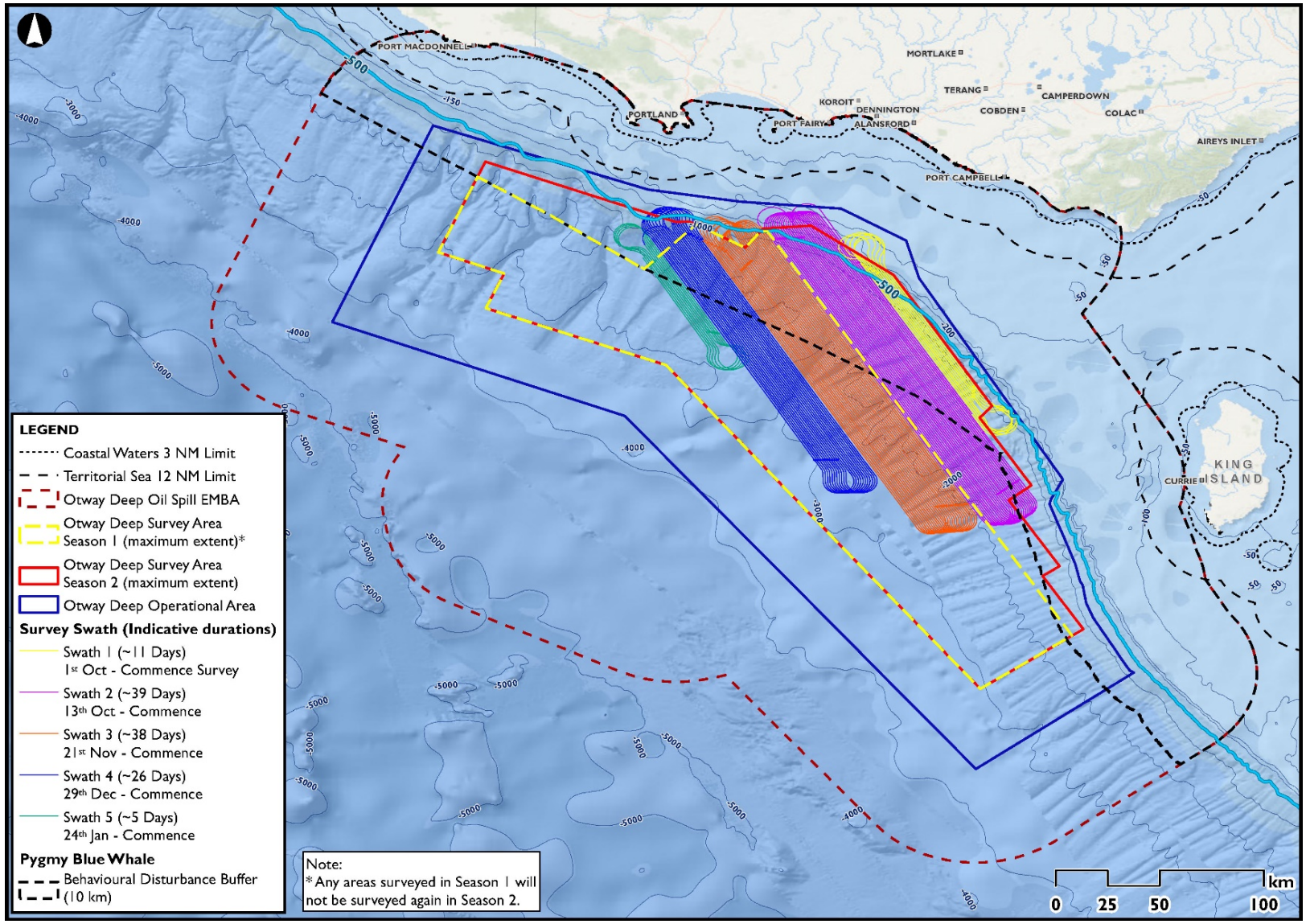

Figure 4.9: Maximum extent of survey area for season 1 showing central acquisition area (preferred area)

4.1.5 Demonstration of acceptability

Criteria	Justification
Marine receptors (general)	Seismic operations (including soft starts and ramping up) will be limited to within the offshore survey area Seismic vessel will start on inshore survey lines and move offshore, and the distance between adjacent survey lines will be 8 to 12 km due to the vessels turning circle. This is greater than the ensonified area of effect for most marine fauna species. Furthermore, there will be a break of 6 to 16 hours while the vessel acquires the next survey line before returning to the area previously surveyed and therefore, if marine biota recover within 12 hours (Stadler and Woodbury 2009) to 24 hours (Popper 2018), therefore, partial-complete recovery expected by the time the vessel returns on the adjacent sail-line. No displacement of species as a result of the survey. Stakeholder concerns/objections received have been merit assessed and control measures developed where required (Section 7). There are no outstanding merited concerns.
Plankton (incl. fish larvae)	Only a small proportion of the widely dispersed plankton populations within the survey area would be exposed at any one time Avoiding shallower areas on the continental shelf, and areas of strong upwelling, where many species are known to spawn reduces the effect to very limited with no lasting impacts on ecosystems, species or habitats and full recovery expected. No population or ecosystem level effects expected.
Fish (incl. spawning)	There are no known areas of high fish diversity/abundance within the survey area due to the deep water across much of the area (>1,000 m). Survey will not have population level impacts on spawning output of commercially important fish and invertebrate species. Seismic vessel will start on inshore survey lines and move offshore, and the distance between adjacent survey lines will be 8 to 12 km due to the vessels turning circle. This is greater than the ensonified area of effect for finfish. Furthermore, after each pass of the seismic vessel, there will be a break of 6 to 16 hours before the vessel returns to acquire the adjacent sail-line. Fish are expected to recover within 24 hours (Popper 2018); therefore, partial-complete recovery of fish is expected. No displacement of commercially important fish species as a result of the survey. No population or ecosystem level effects.
Invertebrates (incl. spawning)	Majority of survey area excludes the biological depth range for rock lobster (<200 m) and giant crab (<400 m). Seismic vessel will start on inshore survey lines and move offshore. Temporal overlap with rock lobster and giant crab depth ranges is small (4 days and 6 days, respectively), and spread over a 50 day duration (50 days required to acquire swaths 1 and 2 of the worst case overlap with giant crab biological depth range in the Central Survey Area). The distance between adjacent survey lines will be 8 to 12 km due to the vessels turning circle, with some recovery expected between lines. Survey area plus 300 m buffer (i.e. predicted ensonified area) represent a small proportion of the fished area for rock lobster (<1%), giant crab (16.6%) and squid fisheries (<0.5%). Survey area does not overlap biological depth range for rock lobster or giant crab in South Australian or Tasmanian waters. Survey will not have population level impacts on spawning output of commercially important fish and invertebrate species. Overlaps hatching periods for rock lobsters and giant crabs, and many females will have released their eggs by the time the survey commences (i.e. hatching commences in September for rock lobster and peaks in October for giant crab). No displacement of commercially important species as a result of the survey. No population or ecosystem level effects.

Criteria	Justification
Marine turtles	No predicted disturbance to marine turtles potentially transiting through the survey area beyond minor behavioural disturbance of a small number of individuals.
Cetaceans	EPBC Act Policy Statement 2.1 Part A Standard Management Measures applied throughout duration of survey. EPBC Act Policy Statement 2.1 Part B Additional Management Measures applied for pygmy blue whale foraging BIA plus buffer and southern right whale aggregation/calving BIA plus buffer and/or during biologically important periods. Controls adopted in EP align with management actions for Blue Whale Conservation Management Plan - no injury is predicted for pygmy blue whales (shut-down zone of 500 m or 1,000 m when adaptive management implemented). Controls adopted in EP are consistent with management objectives for southern right whales and pygmy blue whales - no long-term impact on the recoverability of the whale populations is predicted. Activity EMBA overlaps with the pygmy blue whale foraging BIA therefore, Spectrum will adopt adaptive management procedures as described in Section 4.1.6. No seismic operations in the BIA or 10 km noise buffer during February. No predicted displacement from pygmy blue whale foraging BIA during critical periods. Spectrum will monitor daily SST and Chl-a satellite imagery as pre-cursors to upwelling events to plan when further adaptive management may be required, i.e. PAM monitoring on chase vessel at edge of survey area to detect pygmy blue whales arriving from eastern GAB, and increased precaution zones Control measures that have been described for both southern right and pygmy blue whales will afford protection to other whales in the event that they are encountered in the survey area. No population level effects.
Australian fur seal	No predicted disturbance to Australian fur seals (or breeding colonies/success).
Fisheries	Survey is not planned to be carried out during peak commercial or recreational seasons in key fishing areas No displacement of commercially important species as a result of the survey. No long-term displacement of fishers from fishing grounds (> 1 month) due to the transient nature of the survey vessel in any area and the staged survey plan. No ongoing impact on catchability as fish predicted to recover soon after survey completion. Ongoing consultation will continue to address any outstanding or arising issues with fishers in accordance with expectations under the OPGGS(E) Regulations
Protected areas	No predicted loss of biological diversity in Australian Marine Parks (aligned with IUCN principles) No predicted disturbance to environmental values associated with KEFs.

4.1.6 Environmental performance outcomes and standards

Table 4.14: Environmental performance outcomes and standards for underwater sound from seismic operations

Environmental performance outcome	Environmental performance standard
No mortality or permanent injury to protected marine fauna species due to noise associated with the operation of the seismic source No injury to pygmy blue whales and no disturbance to foraging pygmy blue whales in foraging BIA, including displacement from foraging BIA No injury to southern right whales and no disturbance to southern right whales aggregating and calving in the BIA off Portland and Warrnambool, VIC No injury to other (transient) cetacean species	Spectrum will implement **ALL** Part A standard management measures described in EPBC PS 2.1 relating to the following: • pre start-up visual observation • soft start • start-up delay • operations • power-down and stop work • night-time and low visibility
	Spectrum will implement the following precautionary zones (outside of the pygmy blue whale foraging BIA plus 10 km buffer): • pre-start up visual observation period to 30 mins • soft-start to 30 mins • observation zone to 3 km • low power zone to 2 km (modelling has shown 160 dB SEL for 95% of shots is reached at distance of >1 km from the seismic source) • shut-down zone to 500 m
	Two trained Marine Fauna Observers (MFOs) on the seismic vessel will watch for whales during seismic operations in daylight hours; throughout the duration of the survey.
	Two trained MFOs on the cetacean monitoring chase vessel: • One MFO will watch for whales during seismic operations in daylight hours • One MFO will monitor for whales during seismic operations in periods of low visibility and at night using the thermal imaging camera system
	MFOs will have a minimum of 20 weeks previous experience (recommended by the Marine Mammals Observer Association (MMOA)) of observing for marine mammals at sea, to have gained the skills to be competent at identifying marine mammals, estimating distance, confidence in implementing mitigation actions and experience recording data.
	Thermal Imaging MFO will have completed a thermography training course.
	All marine fauna detection personnel (MFOs, PAM operators and Thermal Imaging MFO) will attend the environmental induction presentation, which will include the environmental sensitivities of the survey area, environmental management strategies, EPO, and EPS as detailed in the EP. At crew changes, this information will be communicated to on-coming personnel during handover.
	In the event that there have been three or more whale-instigated power-down or shut-down situations during the preceding 24 hour period, the seismic vessel will move away from the current area and continue data acquisition in another area (>10 km away)
	If greater than 15 whales are present in observation zone during the pre-start observation, but not close enough to prevent soft start commencing (i.e. outside low power zone), the vessel will relocate to another area (>10 km away)

Environmental performance outcome	Environmental performance standard
No permanent or temporary effects to fish species or to the spawning output of commercially important fish stocks	In the event that there have been three or more whale-instigated power-down or shut-down situations during the preceding 24 hour period and the seismic vessel CANNOT move away from the current area and continue data acquisition in another area (>10 km away), Spectrum will implement the following additional precautionary control measures: • increased pre-start up visual observation period to 45 mins • increased soft-start to 40 mins • increased observation zone to 4 km • increased low power zone to 3 km • increased shut-down zone to 1 km
	Night-time / Low Visibility (until PAM/TI validation is proved successful): At night-time or at other times of low-visibility (when observations cannot extend to 3 km from the acoustic source, e.g. during fog or periods of high winds), the following measures apply for start-up and operations: Start-up may be commenced according to the soft start procedure: • provided that there have not been 2 or more whale instigated power-down or shut-down situations during the preceding 24-hour period; OR • if operations were not previously underway during the preceding 24 hours, the vessel has been in the vicinity (approximately 10 km) of the proposed start-up position for at least 2 hours (under good visibility conditions) within the preceding 24-hour period, and no whales have been sighted. Operations may proceed provided that there have not been 2 or more whale instigated power-down or shut-down situations during the preceding 24-hour period.
	Use of chase vessel with PAM and infra-red equipment on board and one PAM operator and two MFOs. Chase vessel will travel a distance of 10 km in front of the survey vessel and monitor for cetaceans as follows: • First MFO will conduct daytime observations for cetaceans. • PAM operator will monitor for cetaceans at night • Second MFO will monitor for cetaceans at night using the thermal imaging detection system (reliable out to 2 km)
	A seasonal exclusion area will be applied where the seismic vessel will not carry out seismic operations within the foraging area (annual high use area), known foraging area (variable use) BIA for pygmy blue whale foraging and additional 10 km noise buffer area, during the peak foraging month of February.
	The Survey Environmental Advisor (SEA) will monitor MODIS sea surface temperature (SST) and chlorophyll-a (Chl-a) heat maps on a daily basis throughout the survey. This monitoring information will be used to inform Spectrum's understanding of the region and when the upwelling season starts, and the link between SST/Chl-a, upwelling events and the presence of pygmy blue whales. The information will inform management measures for the following season's survey, and interrogated to determine if there are any lags between upwelling events and whales seen/detected.
	Sound source verification (SSV) will only be carried out in the event that Ocean Bottom Nodes are included in the survey. The SSV will be used to validate underwater sound modelling predictions and to inform control measures for ongoing management of underwater sound impacts from the activity for the second survey season. If the modelling is found to have underestimated received sound levels, then the measured streamer data will be used to revise the impact ranges relevant to marine fauna injury/behavioural criteria for the following survey season.
	Increased precaution zones and observation/soft-start durations – to be implemented within 10 km of the pygmy blue whale BIA at all times from October to January: • Pre-start up visual observation period of 45 mins • Soft-start period of 40 mins

Environmental performance outcome	Environmental performance standard
	• Observation zone – 4 km • Low-power zone – 3 km • Shut-down zone – 1 km
	Increased precaution zones and observation/soft-start durations – to be implemented within 15 km of the southern right whale BIA at all times during October: • Pre-start up visual observation period of 45 mins • Soft-start period of 40 mins • Observation zone – 4 km • Low-power zone – 3 km • Shut-down zone – 1 km
	Until PAM detection distances have been validated against MFO visual observation distances, during periods of low visibility and at night the seismic vessel will shut-down in the event of a confirmed SRW detection either comprising at least 2 positive PAM detection records for an individual SRW or if the PAM operator is confident in species identification and distance estimation. Soft-start procedures will not commence until 30 minutes has passed without further SRW detection, or the PAM operator is confident the individual(s) have left the mitigation zone.
	Towed PAM (with PAMGUARD) will be implemented during the survey when the acoustic source is operational as follows: • Seismic vessel – 24 hours a day during the MFO validation exercise, reducing to night time or periods of low visibility • Chase vessel for cetacean monitoring – initially at night or in periods of low visibility during the MFO validation exercise on the seismic vessel, increasing to 24 hours a day (i.e. day time and night time) on completion of the MFO validation exercise.
	The PAM systems used will have the capability to detect vocalisation of whales within the frequencies (10 Hz – 200 kHz). The system used will be Seiche Ltd.'s Digital Thin Line Array (http://www.seiche.com/wp-content/uploads/2017/12/Digital-Thin-Line-Array-Datasheet.pdf), or a system with the same specifications.
	Three passive acoustic monitoring (PAM) operators will operate throughout the duration of the survey as follows: • Initially two PAM operators on the seismic vessel working on rotation to cover both daytime and night time monitoring. • The second PAM operator on the seismic vessel will carry out the MFO validation exercise at the beginning of the survey (see below) to determine the level of accuracy of PAM detection distances. • One PAM operator on the cetacean monitoring chase vessel for night time monitoring activities
	Cetacean monitoring chase vessel will monitor for cetaceans for a period of 45 minutes within the PBW foraging BIA plus 10 km buffer. Soft start procedures can commence: • If no pygmy blue whales are positively observed or acoustically detected within 10 km of the seismic vessel, OR • If no southern right whales are positively observed or acoustically detected within 10 km of the seismic vessel.
	PAM operators will have: • Minimum 20 weeks (recommended by the MMOA) previous experience of PAM for marine mammals at sea, to have gained the skills to be competent at identifying marine mammal acoustic signals and interpreting acoustic software. • Attendance of appropriate training course(s) with instruction on assembly and deployment of specific PAM equipment/software. • Attendance of a course which included instruction on PAMGUARD or other suitable software

Environmental performance outcome	Environmental performance standard
	At the start of the survey during the daytime when there is sufficient visibility, PAM detection distances will be validated against the MFO observations to determine the level of accuracy of distance estimation to targets (vocalising whales) using PAM. If PAM records prove reliable in estimating distances (≤20% deviation), then PAM will be used to trigger low power and shut-down procedures at night and during periods of poor visibility when the whales enter the appropriate precaution zones.
	Survey vessel logs confirm PAM validation exercise is carried out under two sets of conditions: • En-route to the Operational Area and during deployment of streamers, i.e. prior to the first seismic shot, AND • At the start of the survey once the seismic source is operational.
	Lead MFO on seismic vessel to carry out PAM validation exercise with PAM operator, and second MFO to verify cetacean observations (ID and distance estimation).
	Until PAM detection distances have been validated against MFO visual observation distances, OR if PAM records are shown to be inaccurate in estimating distances (>20% deviation), then the seismic vessel will shut-down in the event of a confirmed whale detection by either PAM on the chase vessel or seismic vessel, or Thermal Imaging on the chase vessel. A confirmed PAM detection whilst the vessel is in operation will comprise 2 positive detections, or if the PAM operator is confident in species identification and distance estimation. Start-up and soft start procedures will only commence provided: • there have not been 2 or more whale instigated power-down or shut-down situations during the preceding 24-hour period.
	Redundancy in equipment in case of failure: • Spectrum will have a third PAM system readily available with the same specifications as used on the seismic/chase vessels • Spectrum will have a second thermal imaging camera readily available with the same specifications as used on the chase vessel.
	The survey area for Season 1 has been reduced to the maximum extent to minimise impacts to pygmy blue whales within their foraging BIA and interactions with commercial and recreational fishers in inshore waters
	The source will be shut down if a pygmy blue whale is either positively observed (by MFO in daylight or Thermal Imaging at night/low visibility) OR acoustically detected by the chase vessel travelling 10 km ahead of the seismic vessel when operating within the PBW foraging BIA and 10 km disturbance buffer.
	The source will be shut down if a southern right whale is either positively observed (by MFO in daylight or Thermal Imaging at night/low visibility) OR by the chase vessel travelling 10 km ahead of the seismic vessel when operating within the SRW aggregation BIA and 15 km disturbance buffer.
	As part of the ongoing consultation process, Spectrum will notify all relevant persons four weeks prior to the start of the survey of the survey details including, timing, location, duration
	Commercial fishers actively operating in the survey area and will be issued a 7 to 10 day forecast prior to activities commencing in the survey area.
	Commercial fishers actively operating in the survey area are kept informed of daily survey activities through Spectrum's 24-hour look-ahead communication.
	Disruption to spawning activity by commercially important fish species will be avoided by commencing survey activities inshore and ensuring survey lines shallower than 500 m have been completed prior to the start of December
	Temporal overlap with southern rock lobster and giant crab biological depth ranges are small, 4 days for rock lobster (<200 m depth) and 6 days for giant crab (<400 m depth).

4.2 Impact 2: Underwater sound – vessel / helicopter operations

4.2.1 Description of impact

The survey vessel and the support vessel(s) will generate low levels of machinery noise (e.g. propulsion thrusters). The assessment of underwater vessel noise below is limited to the periods when underwater noise levels from vessel operations are dominant, which only will be during infrequent periods when the airgun array is not operational (e.g. travelling between lines) or firing at less than full power. The area is already subject to intermittent vessel noise due to its proximity to shipping routes.

Helicopter engine noise is emitted at a range of frequencies, and generally of a low frequency below 500 Hz (Richardson et al. 1995). Sound pressure is greatest at the surface and rapidly diminishes with increasing depth. Underwater noise reduces with increasing helicopter altitude, but the duration of audibility often increases with increasing altitude.

Source levels from typical seismic vessels are approximately 165 to 180 dB re 1 µPa (root mean squared (rms) for vessels <100 m long and 180 to 190 dB re 1 µPa (rms) for vessels >100 m long (Richardson et al. 1995; Kipple and Gabriel 2003; and Heitmeyer et al. 2004). Marine fauna at distance from the vessel will be exposed to much lower noise levels due to decay of the sound energy as it travels through the water.

Underwater noise emissions from vessel operations are generally within or below the range of natural noise levels experienced by marine fauna, and therefore not expected to cause any physiological damage to fauna (McCauley 1998, 2003; McCauley and Jenner 2001; and Richardson et al. 1995). The primary auditory effect of vessel noise on marine fauna is the potential masking of biologically significant sounds (Southall et al. 2007). Potential behavioural effects on marine fauna due to underwater noise from vessels also include changes in vocalisation characteristics and disturbance to foraging, navigation and reproductive activities.

The majority of acoustic energy radiated from large commercial vessels is below 1 kHz, and so the greatest potential for masking exists for marine fauna that produce and receive sounds within this frequency band; primarily baleen whales, pinnipeds, fish, and possibly some toothed whales (Southall et al. 2007). Acoustic masking at higher frequencies (1 to 25 kHz) may affect toothed whales (beaked whales, sperm whales, dolphins and porpoises) near the vessel.

There has been relatively little behavioural observation of cetaceans exposed to continuous, low-level underwater noise, such as from vessels. Small cetaceans are commonly observed swimming near vessels; this attraction indicates that the noise is not having a detrimental effect on the animals.

The frequency range of vessel noise overlaps the hearing ranges of many fish species (Amoser et al. 2003). Hearing impairment (i.e. TTS) has been recorded for fish exposed to continuous noise from small boats and ferries for two hours (Vasconcelos et al. 2007). However, recovery was observed on cessation of vessel noise.

Encounters with marine fauna species are expected due to the overlap of the Activity EMBA with the pygmy blue whale foraging and distribution/migration BIA, however through the application of the control measures that will be implemented to manage the effects of underwater sound from seismic operations to ALARP, these animals are expected to be able to avoid actively the survey vessel and support/chase vessels.

When the airguns are not operational, there may be localised behavioural disturbance of fauna in the immediate vicinity of the vessel during operations. However, this would be limited to a temporary change in behaviour due to avoidance of the area but no injury or lasting impact.

Increased underwater and airborne noise from helicopter movements has the potential to cause impacts to birds along flight paths due to behavioural disturbance, and behavioural changes in cetaceans. Airborne noise from helicopters generally only penetrates water at angles greater than 26 degrees (Richardson et al. 1995), resulting in a temporary change in behaviour (e.g. diving, tail slaps in cetaceans), which return to normal behaviour once the helicopter has passed (Richardson et al. 1985; Richardson and Malme 1993). Occasional helicopters are thought to have no long-term impact on cetaceans (NMFS 2001).

There are no offshore islands in the Activity EMBA and so no nesting or roosting for migratory seabirds. The Portland area has several aggregation sites for the Australasian gannet, with the closest breeding sites for EPBC protected bird species on King Island. Helicopter operations are not planned to originate from King Island and so disturbance to these breeding sites is unlikely. Helicopter movements will be intermittent.

4.2.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). Control measures that were rejected as cost outweighing the benefit or not practicable are listed below.

Control measures rejected	Cost benefit analysis	Impact reduction?	Control adopted
ALARP assessment technique – EIA			
Do nothing – no MSS	The survey is critical in providing data to tie-in with Spectrum's reprocessing of historic 3D seismic data inshore of the survey area. Minimal benefit given the precautionary control measures to be implemented.	Yes	No
Residual impact			
	Consequence	**Likelihood**	**Risk ranking**
	Negligible	Unlikely	Low

4.2.3 Demonstration of acceptability

Criteria	Justification
Seismic operations (including soft starts and ramping up) are limited to within the survey area.	Seismic operations (including soft starts and ramping up) will be limited to within the survey area
Seismic vessel operations limited to within the Operational Area (i.e. does not enter shallower areas for OBN placement)	• Seismic vessel only operates within the Operational Area (with exception of transit to/from Operational Area, and if the event of an emergency)
No direct effect on EBPC Act listed MNES that is not recoverable at a population level	• All control measures adopted for managing impacts from underwater sound from seismic operations to ALARP will afford added protection in reducing exposure of EPBC listed MNES to vessel noise
No displacement of marine fauna from biologically important areas	• No disturbance to breeding or aggregation sites for Australasian gannet and breeding birds on King Island.
No population or ecosystem effects.	• Avoiding shallower areas on the continental shelf, and areas of strong upwelling, where may species are known to spawn reduces the effect to very limited with no lasting impacts on ecosystems, species or habitats
Vessel operations will be compliant with all maritime law relating to marine fauna, notably cetaceans.	• Vessel operations will be compliant with the EPBC Regulations 2000. • Predictions are therefore considered acceptable because these Regulations provide separation distances between vessels and whales
No specific stakeholder concerns have been raised regarding noise emissions from vessel/helicopter operations. Concerns raised regarding noise from operation of the airgun array have been addressed in Section 7 and assessed in Section 4.1.	• Stakeholder concerns/objections received have been merit assessed and control measures developed where required (Section 7). There are no outstanding merited concerns.

4.2.4 Environmental performance outcomes and standards

Table 4.15: Environmental performance outcomes and standards for underwater sound from vessel operations

Environmental performance outcomes	Environmental performance standards
No disturbance to aggregating/calving and migrating southern right whales No disturbance to foraging and migrating pygmy blue whales No impacts on other marine fauna species behaviours	All internal combustion engines on board the vessel will be well maintained in accordance with the manufacturer's specifications.
	Interaction between survey vessel and cetaceans (whales and dolphins) within the Operational Area will be consistent with EPBC Regulations 2000 – part 8 division 8.1 (Regulation 8.04) – interacting with cetacean regarding vessel speeds and approach distances
	All control measures adopted for managing impacts from underwater sound from seismic operations to ALARP will afford added protection in reducing potential effects from vessel noise to ALARP

4.3 Impact 3: Physical interaction with other marine users

4.3.1 Description of impact

4.3.1.1 Impacts to recreational and commercial fishing

Recreational fishing vessels will be limited in number and frequency within the proposed MSS area due to weather and travel restrictions. However larger vessels may sometimes fish continental slope waters within the Operational Area. Survey activities may require a recreational fishing vessel move out of the way of the approaching seismic vessel, however the likelihood of this is remote and the movement is expected to be limited to a distance of a few hundred metres in most cases to ensure safe avoidance of the vessel and seismic streamers. Given the mobility of these vessels and broad area over which they typically fish, the impacts to recreational and charter fishers because of the physical presence of survey vessels is expected to be minor.

For commercial fishers, a detailed review of all publicly available information on Commonwealth and state-managed fisheries with jurisdictional boundaries overlapping the Activity EMBA was carried out. Consultation with stakeholders also identified concern over the impacts of seismic activities on commercial fisheries. Where specific concerns are described those that are related to physical interaction with fishers can be summarised as (1) interference with fishing gear, and (2) loss of access to fishing grounds (displacement).

Commercial fisheries potentially affected through interference with fishing gear include those that utilise fishing methods that may become entangled in the seismic streamers or inadvertently run over by a survey vessel. Equipment such as lobster or giant crab pots which are left in water for days at a time and attached to surface floats are most prone to this threat.

Displacement from fishing areas also has potential to cause considerable disruption to fishing activity. Information enabling assessment of displacement to commercial fisheries that may be active within the Operational Area. The Operational Area defines the area of potential displacement since it encompasses the overall area in which survey activities may impact the activities of fishers. The extent to which this occurs, however, will depend on the nature of the activities and in cases such as vessel transit or short-term fishing activities (i.e. lasting a few hours) there may be no disruption at all. In terms of industry-scale impacts, the number of active fishers is also an important consideration.

For each commercial fishery, the information used to assess potential displacement includes the depths fished by operators within the fishery, and the amount of this 'potential fishing area' within both the Operational Area and the overall jurisdiction of the fishery. For the five Commonwealth fisheries the area of potential fishing area within the Operational Area ranges from 481 km2 for the Squid Jig Fishery to 3,236 km2 for the Scalefish Hook Sector (SHS). Due to the broad depth range and large geographic extent of the SHS fishery, the amount of potential fishing area within the Operational Area is only 0.1% of the overall potential fishing area of this fishery. For other Commonwealth fisheries, the amount of overall potential fishing area within the Operational Area ranges from 0.2 to 5.5% of the overall fishing area for the respective

fisheries. All of these Commonwealth fisheries operate year-round and catches are taken over a broad area. Available information (including from fishers) also indicates that operators in these fisheries are mobile and have broad fishing ranges. This includes the Commonwealth Trawl Sector (CTS), which has the largest proportion of overall potential fishing area overlapping the Operational Area (5.5%). This percentage increases to 9.9% if the extent of potential fishing area is limited to the area west of Tasmania, based on information provided by a trawler fisher. In terms of temporal overlap, the survey vessel will be acquiring data to 1000 m depth for approximately 14.1 days, which is 3.9% of the fishing season for this sector.

The three state fisheries with potential fishery area within the Operational Area are the Victorian Rock Lobster, Giant Crab and Multi-species Ocean Fisheries. The number of fishers within each of these fisheries that is active in the Operational Area is less than five. Whilst jurisdiction of the Multi-species Ocean Fishery extends to 20 NM offshore, leading to an overlap of 521 km2 with the Operational Area, depth restrictions limit this fishery to shallower shelf waters. For the Rock Lobster Fishery there is 828 km2 of potential fishing area to depths of 200 m within the Operational Area, which is 4.9% of the overall fishing area for this fishery. However, the survey vessel will only be acquiring data within these depths for a total of four days during the survey period and, as detailed below for the giant crab fishery, survey activity in these depths will be completed by the time the rock lobster fishery opens on the 16th November. The above information indicates that for most fisheries the amount of fishing area in which they may experience potential disruption to fishing activity due to an overlap in respective activities represents a minor proportion of the overall area in which they may fish.

Considering other fisheries, the survey vessel will be acquiring data at depths of less than 1,000 m (the maximum actively fished depth) for less than 15 days of the full 120-day survey duration (range of 1.4 to 5.1 days within each survey swath. Fishers operating to these depths include Commonwealth trawlers and line fishers who may still operate within the same swath in which the seismic vessel is operating.

Potential disruption to fishing activities will also be minimised through advance notification of the swath in which the survey vessel will be acquiring data so that fishers may plan their activities to suit. This will also minimise potential loss or damage to fishing equipment, in particular pots deployed by giant crab fishers.

Based on the above assessment, impacts to recreational and commercial fisheries as a consequence of physical presence of seismic vessel are expected to be minor.

Table 4.16: Fishing area, vessel numbers and fishing season for Commonwealth and state fisheries potentially active within the Operational Area

Fishery	Fishing limits	Potential fishing area within the Operational Area (km^2)[1]	Overall fishing area (km^2)[1]	% of overall fishing area in Operational Area	Active number of vessels (2016–2017)	Fishing season & temporal overlap with the Otway deep MSS
Southern and Eastern Scalefish and Shark Fishery – Commonwealth Trawl Sector	As per Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016	8228	149,659	5.5	34	All year
Southern and Eastern Scalefish and Shark Fishery – Commonwealth Trawl Sector	As above and west of Tasmania	8228	83076	9.9	-	All year
Southern and Eastern Scalefish and Shark Fishery – Commonwealth Trawl Sector	As above but limited to maximum depth of 1000 m	3615	71217	5.1	-	All year
Southern and Eastern Scalefish and Shark Fishery – Gillnet, Hook and Trap Sector	State boundary to 183 m depth	1,402	310,912	0.4	36	All year

Fishery	Fishing limits	Potential fishing area within the Operational Area (km^2)[1]	Overall fishing area (km^2)[1]	% of overall fishing area in Operational Area	Active number of vessels (2016–2017)	Fishing season & temporal overlap with the Otway deep MSS
Southern and Eastern Scalefish and Shark Fishery – Scalefish Hook Sector	State boundary to 800 m depth	3,236	346,857	0.1	17	All year
Southern and Eastern Scalefish and Shark Fishery – Scalefish Hook Sector	State boundary to 800 m depth for waters west of Tasmania and east of Kangaroo Island	3,236	117,302	2.8	-	All year
Southern Squid Jig Fishery	State boundary to 120 m depth	481	289,320	0.2	7	All year (peak Jan–June)
Small Pelagic Fishery	100–400 m	1,842	135,973	1.3	3	All year
VIC Rock Lobster Fishery	0–200 m	828	16,949	4.9	4	16 Nov–14 Sep (male) 16 Nov–31 May(female)
SA Rock Lobster Fishery		0	223,417	0.0	< 5	1 Oct–31 May
TAS Rock Lobster Fishery		0	104,931	0.0	< 5	15 Nov–30 Sept (male)/ 15 Nov–30 Apr (female)
VIC Giant Crab Fishery	150–400 m	155.1	2,069	7.5	< 5	16 Nov–14 Sept (male)/ 16 Nov-31 May (female)
SA Giant Crab Fishery		0	11,305	0.0	< 5	1 Oct–30 April
TAS Giant Crab Fishery		0	13,819	0.0	< 5	All year (male)/15 Nov–31 May (female)
VIC Multi-species Ocean Fishery	20 NM from shore	521	49,649	1.0	< 5	All year

[1] Based on fishing limit.

Table 4.17: Temporal and spatial overlap with swaths 1-5 of the central acquisition area

Swath	Number of days acquiring data in depths <400 m within Victorian giant crab fishery actively fished area	Spatial overlap (km^2) with Victorian giant crab fishery actively fished area (150–400 m depth)	Commonwealth trawl fishery number of days acquiring data in depths <1,000 m
1	1.6	94	3.2
2	0	0	5.1
3	0	0	1.4
4	0	0	1.3
5	0	0	3.1

4.3.1.2 Impacts commercial shipping and oil and gas activities

Within the Otway Basin, there is significant commercial shipping activity, the majority of which is associated with the mining and oil and gas industry. The northern area of the Activity EMBA is a high-density shipping area due to the passage of vessels from VIC, SA and WA through the Bass Strait. Interactions with vessels outside these areas (southern area of Activity EMBA) are also possible, but less likely.

Supply vessels supporting Beach Petroleum's facility may pass through the survey area. The consultation process identified 3D Oil's seismic survey plans for their permit area (T/49P) west of King Island and immediately east of the Otway Deep survey area may overlap the timing for the Otway Deep MSS.

Spectrum has consulted with Beach and 3D Oil and will continue to keep them informed of Spectrum's survey plans prior to and throughout the survey and implement appropriate controls to ensure the seismic survey will not affect activities at any operational facility/vessel, including development of a Concurrent Operations (CONOPS) Plan where required.

A Concurrent Operations (CONOPS) Plan will be required in the event of moving the seismic vessel (or any part of its streamer), the support boat or chase vessel within the Cautionary Zone of another facility/vessel. The Cautionary Zone is defined by a 2.5 NM radius around a vessel, facility or major sub-sea installation. A CONOPS Plan will be developed for the Otway Deep MSS and agreed with the relevant operator(s) in the event that the seismic survey vessel is required to enter the Cautionary Zone of another facility/vessel. In areas where diving operations are taking place, specific dive procedures will be defined in the CONOPS Plan, including an extension of the Cautionary Zone to 10 km, and the requirement for a joint risk assessment in advance of any CONOPS.

4.3.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental performance Outcomes and Standards below). Control measures that were rejected as cost outweighing the benefit or not practicable are listed below

Control measures rejected	Cost benefit analysis	Impact reduction	Control adopted
ALARP assessment technique – good practice			
Seismic acquisition will only occur during daylight hours.	There are substantial additional costs in limiting acquisition to daylight hours. Interactions with fishing and shipping vessels would still potentially occur, therefore costs outweigh benefits.	Yes	No
ALARP assessment technique – EIA			
Do nothing – no MSS	Titleholders are required by NOPTA to acquire seismic data within specified time frames. Minimal benefit given the predicted low impact on other users. Costs disproportionately higher than benefits.	Yes	No
Avoid shipping routes	Shipping occurs throughout the survey area and avoiding the eastern section would seriously compromise the survey objectives. Vessel interactions are manageable through the support vessel and the cost (loss of survey data) outweighs the benefits.	Yes	No
Seismic acquisition will only occur outside key fishing seasons.	Fishing occurs all year round in some region of the Operational Area. Costs outweigh benefits	Yes	No
Compensation in the event fishers are affected as a result of the survey from displacement	No predicted displacement of fishers from fishing grounds.	Uncertain given no predicted affects	No

Control measures rejected	Cost benefit analysis	Impact reduction	Control adopted
Reduce survey and Operational Areas to exclude water depths <400 m to remove overlap with biological depth range of giant crab and thereby remove overlap with Victorian Giant Crab Fishery.	Spectrum cannot reduce the survey or Operational Area to exclude water depths <400 m that overlap the actively fished area of the Victorian Giant Crab Fishery as this is considered to be a prospective area for hydrocarbons based on previous well results in the area, legacy seismic results and the understanding of the prospectivity of this area. Spectrum needs to acquire new 3D seismic data here to be processed using modern 3D PSDM techniques. Costs disproportionately higher than benefits.	Small reduction, given temporal overlap with actively fished area of Victorian Giant Crab Fishery is 6 days total, and only 4 days of their fishing season.	No
Additional control measures considered in response to specific Victorian Giant Crab Fisher claims/objections: 1. on-water avoidance measures 2. excising the area that overlaps the actively fished area 3. biological monitoring 4. evidence based compensation arrangements 5. spatial separation of the seismic vessel and fishing vessel(s) of >2 nautical miles (~3.7 km)	Spectrum has considered the additional controls as follows: 1. No further control measures in addition to those already described herein are required to reduce risk to ALARP. There will be no displacement of the fisher from the area of fishing operations as the seismic vessel will not be operating in that fishing area during the time that fisher is actively fishing. Cost disproportionately higher than benefits as no displacement. 2. Spectrum cannot excise the specific fishing area from the survey area. Excising that fishing area would compromise the geophysical objectives of the survey. No environmental benefit in excising that fishing area because there is no temporal overlap with fishing activities. The proposed Otway Deep MSS has been designed to tie into the Otway Reprocessing Project to form a contiguous exploration dataset. The survey area overlap with the fishery area is the smallest area required to tie the Otway Reprocessing project area with the Otway Deep Survey Area. Spectrum has sought to minimise the area of overlap to the smallest area possible in the design of the Otway Deep MSS. Cost disproportionately higher than benefits. 3. Biological studies are not considered necessary to reduce impacts to ALARP because Spectrum's assessment is based on relevant scientific data and the impact assessment is sufficiently conservative to address any uncertainty. Cost disproportionately higher than benefits. There will be no temporal overlap in his fishing area during the time of active fishing and the MSS survey. Therefore, an evidence-based compensation scheme is not required to reduce impacts to ALARP. Cost disproportionately higher than benefits as no displacement. 4. There is no benefit in increasing the separation distance between the seismic vessel and fishing vessels from 3 km to 3.7 km as 3km is considered sufficient to avoid displacement and catchability effects. As there is a lack of temporal overlap between the seismic survey and the giant crab fishing season in the actively fished area, there is negligible risk of displacement, collision or interference on the water. Underwater sound effects are predicted to be limited to < 300 m and therefore the 3 km separation distance is conservative, and no further measures are required to reduce biological and fishery impacts to ALARP. Cost disproportionately higher than benefits as no displacement.	Unlikely given no predicted effects	No

Residual impact

Residual impact	Consequence	Likelihood	Risk ranking
	Moderate	Unlikely	Medium

4.3.2.1 Demonstration of acceptability

Criteria	Justification
Seismic operations (including soft starts and ramping up) are limited to within the survey area.	Seismic operations (including soft starts and ramping up) will be limited to within the survey area
The seismic vessel remains within the Operational Area and does not enter the shallow waters of the OBN placement area.	Survey will be a maximum of 120 days. Seismic vessel will be limited to the extent of the Operational Area (except during transit between Operational Area and mainland and in the event of an emergency e.g. oil spill) Only support /chase vessels be used for OBN deployment/recovery operations
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/objections, where required. No outstanding merited concerns that are not being addressed.	Claims that seismic surveys pose a risk of interference with fishing activities, or may affect fish stocks or catchability, have some merit. The merit in this specific case depends on amount of overlap of seismic activity with key fishery areas and has been addressed appropriately. Stakeholder concerns/objections received have been merit assessed and control measures developed where required. There are no outstanding merited concerns Ongoing consultation will address any outstanding or arising issues with fishers in accordance with expectations under the OPGGS(E) Regulations.
No interference with commercial fishers to a greater extent than is necessary to complete the Otway Deep MSS in a reasonable and timely manner.	Fishers are still able to operate within four out of the five swaths at any one time. Moreover, fishers with fishing equipment that is only deployed or set for a matter of hours (e.g. trawlers, squid and line fishers) will be able to fish in the same swath in which survey activities are underway. In addition, fishers will be kept informed of survey activities on a weekly and daily basis so that they may plan accordingly.
Survey does not negatively impact fish stocks or recruitment levels.	Short-term disturbance limited to a few commercially trawled species over a small area of the total fishery area (2%). Assessment of potential effects to spawning, fish larvae and key commercially fished species predicted no medium to long term disturbance to these species as a result of seismic noise. Seismic vessel will start on inshore survey lines first and then move offshore, distance between preceding survey line and following line will be 8 to 12 km due to vessel turning circle. This is greater than the ensonified area of effect for most marine fauna species, meaning that previously ensonified areas will have between 6 and 16 hours while the vessel acquires the next line before returning to the back to the area immediately surveyed prior to that. Recovery expected within 12 hours based on Stadler and Woodbury (2009), so some if not complete recovery could be expected. No ongoing impact on catchability as fish predicted to recover soon after survey completion. No fish population or ecosystem level effects.
No loss or damage to fishing equipment or lost income arising from delays in returning the fishers' equipment to full working order (either through repair or replacement)	Ongoing consultation will enable fishers to plan fishing activities to avoid areas where survey vessels are active, and enable Spectrum to plan day-to-day activities around key fisheries drivers. Survey support vessels will be positioned ahead of seismic vessel to look out for obstructions including fishing equipment. On-water radio communications between survey and fishing vessels to avoid setting of fishing gear and entanglement.
Vessel operations will be compliant with all maritime law relating to navigation and safety at sea.	The seismic vessel will maintain appropriate lighting, navigation and communication at all times to inform other users of the position and intentions of the survey vessel, in compliance with the *Navigation Act 2012* and Chapter 5 of the International Convention on the Safety of Life at Sea (SOLAS Convention). Predictions are therefore considered acceptable to other marine users for safety and navigation.
Overlap with known fishing activities are eliminated or, if not able to be eliminated, reduced to the least extent for a commercially viable survey	There will be no displacement of Victorian giant crab fishers from their area of fishing operations as the seismic vessel will not be operating in this actively fished area after 16 November. The seismic vessel will be more than 9 km from the boundary of the active area of fishing operations (at its closest point) by the time the Victorian giant crab fishery commences fishing on 16 November. No infill or repeat survey acquisition activities after 16 November within the Victorian giant crab actively fished area.

4.3.3 Environmental performance outcomes and standards

Table 4.18: Environmental performance outcomes and standards for physical interactions with other marine users

Environmental performance outcome	Environmental performance standard
No interference with commercial fishers to a greater extent than is necessary to complete the Otway Deep MSS in a reasonable and timely manner. No loss or damage to fishing equipment or lost income arising from delays in returning the fishers' equipment to full working order (either through repair or replacement)	Vessel to maintain appropriate lighting, navigation and communication at all times to inform other users of the position and intentions of the survey vessel, in compliance with the *Navigation Act 2012*, COLREGS (International Regulations for Preventing Collisions at Sea 1972), Chapter IV (Radiocommunications) and Chapter V (Safety of Navigation) of SOLAS (International Convention on the Safety of Life at Sea 1974).
	Vessel navigational lighting and communication system managed in accordance with AMSA Marine Orders Part 30: Prevention of collisions, Part 21: Safety and emergency arrangements and Part 27 (Safety of navigation and radio equipment).
	Continuous (24 hour) survey operations with multiple trained crew (STCW95/Elements of Shipboard Safety), and monitoring of vessel position (radar) and depth at all times during seismic acquisition.
	The Australian Hydrographic Service (AHS) advised of the survey details (survey location, timing) four weeks prior to mobilisation and following demobilisation for issue of Notice to Mariners.
	AMSA's RCC will be advised of the survey vessel's details, satellite communications details, area of operation and requested clearance from other vessels. This information will be notified to AMSA RCC 24 to 48 hours before operations commence
	AMSA RCC will be notified at the end of the survey when operations have been completed
	Survey vessel will be equipped with Automatic Radar Plotting Aid (ARPA) for detection of vessels, speed and heading.
	Support vessel(s) to manage vessel interactions and maintain communications with commercial shipping in the survey area.
	Tail buoys clearly marked to identify streamer ends to other users.
	In-water equipment lost will be recovered, if retrievable where safe and practicable to do so.
	AMSA and AHS to be advised of the loss of large items of buoyant waste and lost equipment (potential navigational hazards).
	Access agreements will be agreed with oil and gas titleholders.
	Pre-planning search of NOPSEMA approvals data to identify potential for overlap with other seismic surveys
	As part of the ongoing consultation process, Spectrum will notify all relevant persons four weeks prior to the start of the survey of the survey details including, timing, location, duration
	Commercial fishers actively operating in the survey area and will be issued a 7 to 10 day forecast prior to activities commencing in the survey area.
	Commercial fishers actively operating in the survey area are kept informed of daily survey activities through Spectrum's 24-hour look-ahead communication.
	Spectrum will undertake a review every six months following approval of the EP and two months prior to commencement of activities to ensure that any new stakeholders are identified and consulted.
	No recreational fishing from the seismic and support vessels.
	Payment of compensation to the rightful owner for any fishing equipment that has been damaged beyond repair by the survey or lost as a result of the survey activities and cannot be re-used. Payment of compensation for lost income to fishers arising from delays in returning the fishers' equipment to full working order (either through repair or replacement)
	The seismic vessel will adhere to specific CONOPS procedures when operating within the Cautionary Zone around another facility/vessel. Note that the standard Cautionary Zone is 5 km.
	During CONOPS, communications will be maintained with other facilities/vessels.
	In the event that another vessel is acquiring seismic data in the region, the survey vessel shall not acquire data simultaneously within 40 km of the other seismic vessel in order to avoid cumulative impacts to marine fauna.

Environmental performance outcome	Environmental performance standard
	Provision of bathymetric survey data to commercial fishers who have requested the data.
	Spectrum will continue to advise relevant fishers of planned sail-lines and dates and if any issues are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflicts. Controls to be considered will include: • Moving to another sail-line • Deviating around fishing activity area by 3 km • Allowing fishers to fish area prior to seismic acquisition • Minimise survey activity in areas where there is known fishing activity.
	Spectrum will take reasonable steps to avoid or minimise conflict with other marine users, should such a conflict be identified during ongoing consultation with stakeholders.
	Long-term displacement of fishers will be avoided by ensuring that areas shallower than 1,200 m within each survey swath do not take more than one month to complete
	Disruption to spawning activity by commercially important fish species will be avoided by commencing survey activities inshore and ensuring survey lines shallower than 500 m have been completed prior to the start of December
	The time between adjacent survey lines (including repeat and infill lines) will be greater than 24 hours duration.
	Temporal overlap with southern rock lobster and giant crab biological depth ranges are small, 4 days for rock lobster (<200 m depth) and 6 days for giant crab (<400 m depth).
	SETFIA will send SMS (text) notifications to all fishers that it holds contact telephone numbers to provide details of the survey timing, area, location. SMS' will be sent at the following intervals: • At 3, 2 and 1 months prior to survey commencement • At 7, 4, 2, 1 days prior to survey commencement • As required during the survey • Once at the conclusion of the survey. The following information will be provided in the SMS: • Timing of survey • Duration of survey • Link of a map of the survey polygon to be acquired • Other information deemed necessary at the time of sending the SMS.
	No seismic survey (including infill lines) within the Victorian giant crab actively fished area after 15 November

4.4 Impact 4: Seabed disturbance – ocean bottom nodes

4.4.1 Description of impacts

Ocean bottom nodes are concrete blocks measuring 0.15 m in diameter and 0.63 m long and expected to biodegrade over the long term (10 years). Impacts include disturbance to the seabed and associated benthic habitats, disturbance to shipwrecks and potential snaring by fishers' equipment.

Temporary smothering / displacement of a small area of seabed habitat may result from OBM placement. Potential impacts will be limited to a small area of physical disturbance of substrates, benthic habitats and communities in a localised area (i.e. immediate footprint of the OBN), with only short-term effects on communities in the disturbance footprint and no effects on ecosystem function. The concrete ballast will be made of natural biodegradable materials and so full recovery of benthic habitats is expected.

Spectrum will not deploy OBNs over known wrecks.

The OBN placement area overlaps the Commonwealth Trawl Sector fishery jurisdictional area. Consultation has indicated that depth ranges for trawling operations are up to 1,000 m, so the overlap would be limited to the northern and north-eastern areas of the Activity EMBA. The concrete ballast blocks eventually biodegrade within about 10 years. In addition, Spectrum are investigating design modifications to 'smooth' the edges of the concrete blocks to remove the risk of trawling nets snagging and becoming damaged.

Spectrum has consulted with relevant Commonwealth Trawl Sector fishers known to be operating in the Activity EMBA and provided draft OBN GPS coordinates for their review to determine if the locations would impact their fishing operations/grounds. In general there are only concerns for OBN locations between 100 to 1,000 m water depths. Consultation with an individual trawl operator have been underway regarding one of the shallower OBN locations (i.e. <1,000 m depth) to identify another location on the seabed for the unit. Consultation with fisher stakeholders will be ongoing through the survey planning period in order to further refine suitable locations for deployment of the OBNs.

Spectrum will not deploy OBNs within the Zeehan Marine Park Multiple Use Zone of the Zeehan Commonwealth Marine Park, nor on the canyon heads between 200 and 350 m water depth within the Western Tasmanian Canyons KEF.

4.4.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental performance outcomes and standards below). No measures were rejected as cost outweighing the benefit or not practical.

Residual Impact			
	Consequence	Likelihood	Risk Ranking
	Minor	Unlikely	Low

4.4.3 Demonstration of acceptability

Criteria	Justification
The seismic vessel remains within the Operational Area and does not enter the shallow waters of the OBN placement area.	Seismic vessel will be limited to the extent of the Operational Area (except during transit between Operational Area and mainland and in the event of an emergency e.g. oil spill) Only support /chase vessels be used for OBN deployment/recovery operations
No disturbance to benthic habitats as a result of deployment of the OBNs.	No deployment of OBNs in areas of sensitive benthic habitats and/or communities
No damage to fishing gear (trawl nets) as a result of OBNs or concrete blocks used as ballast for OBN units	OBNs will not be located in areas actively trawled. Location for placement of OBNs agreed in advance with affected fishers. Minimal predicted disturbance to fishers from OBN placement because communications at sea will alleviate issues and avoid damage to fishing gear (trawl nets) as a result of OBNs or concrete ballast blocks. Concrete ballast blocks will be biodegradable.
No direct effect on EBPC Act listed MNES that is not recoverable at a population level.	There are no EPBC Act listed MNES predicted to be impacted by the potential impacts from seabed disturbance from deployment of OBNs. No more than possible incidental effects to flora and fauna in the local vicinity of the discharge or footprint of disturbance, and no impact on critical activities or habitats. No population or ecosystem level effects. Absence of areas of sensitive habitats susceptible to long-term effects, recovery of any areas disturbed with no medium to long-term effects on diversity. No predicted effects to the Zeehan Marine Park or West Tasmanian Canyons KEF.
Vessel operations will be compliant with all maritime law relating to navigation hazards	OBNs will be deployed in accordance with standard approved operating procedures for deployment.
Stakeholder concerns/ objections received have been merit assessed and control measures developed to address merited concerns/ objections, where required. No outstanding merited concerns that are not being addressed	Claims that deployment of OBNs on seabed pose a risk of interference with fishing activities have some merit. Spectrum are investigating design modifications to 'smooth' the edges of the concrete blocks to remove the risk of trawling nets snagging and becoming damaged. Stakeholder concerns/objections received have been merit assessed and control measures developed where required (Table 9.1). There are no outstanding merited concerns. Ongoing consultation will address any outstanding or arising issues with fishers in accordance with expectations under the OPGGS Regulations.

4.4.4 Environmental performance outcomes and standards

Table 4.19: Environmental performance outcomes and standards for seabed disturbance associated with deployment of OBNs

Environmental performance outcome	Environmental performance standard
OBNs are deployed and recovered in a manner that prevents marine pollution, disturbance to benthic habitats and interference with commercial fishing gear	One month prior to the commencement of the survey, Spectrum will agree and confirm locations for deployment of OBNs with relevant fishers operating within the Activity EMBA
	Vessel survey crew will be inducted in deployment and recovery of OBNs.
	Concrete ballasts are made from biodegradable concrete
	OBNs will not be deployed on the known shipwrecks in the Activity EMBA
	OBNs will not be deployed within the Zeehan Marine Park Multiple Use Zone
	OBNs will not be deployed on the canyon heads between 200 and 350 m water depth within the West Tasmanian Canyons KEF

4.5 Impact 5: Light emissions – vessels

4.5.1 Description of impact

Lighting is required for safe navigation and for safe work practices at night onboard the seismic survey vessel (Operational Area, except for transiting to/from mainland to survey area and in the event of an emergency) and from the support/chase vessel (in the OBN placement area within the Activity EMBA.).These light emissions may have adverse impacts on photo-sensitive fauna:

- Disorientation, attraction or repulsion of sensitive marine fauna (e.g. juvenile seabirds)
- Disruption to natural behavioural patterns and cycles, e.g. enabling nocturnal foraging.

Habitat for seabirds and shorebirds is well represented throughout the region; however, no nesting or resting areas for birds occur in the vicinity of the Operational Area (the nearest is >40 km away on King Island). Given the short duration of the activity and distance offshore from breeding and resting sites, light disturbance to birds is likely to be restricted to behavioural changes by a small number of birds in the immediate vicinity of the vessel. Any effect of exposure is not expected to impact on migration or other behaviours (nesting/foraging), with no detectable effects at a population level.

There are no nesting sites or BIAs for marine turtles in the region of the Operational Area, therefore the potential impact to marine turtles is negligible, with no detectable effects at a population level.

Squid, plankton and fish can aggregate directly under downward facing lights on the water, attracting predatory fauna. The constant movement of the vessel will reduce this potential significantly. It is expected that any potential impact of increased predation would be undetectable at a population level, and only affect transient individuals.

4.5.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see EPOs and standards below). Those measures that were rejected as cost outweighing the benefit or not practical are listed below.

Control measures rejected	Cost benefit analysis
ALARP assessment technique – EIA	
No night-time operations.	Limiting seismic activities to daylight hours would significantly extend the time required to acquire data for individual activities. Activities will take place >40 km from land which will reduce likelihood of attraction of shorebirds/seabirds. No turtle nesting beaches in region. Negligible environmental benefit in 12-hour operations, but significant increase in vessel charter costs. Sacrifice (additional vessel costs) disproportionately higher than benefit. Limited benefit due to low likelihood of night-time encounters with sensitive receptors in survey area
Residual Impact	

	Consequence	Likelihood	Risk ranking
	Minor	Unlikely	Low

4.5.3 Demonstration of acceptability

Criteria	Justification
The seismic survey is short-term and vessels do not operate outside of Activity EMBA (except for transiting to/from mainland to Activity EMBA and in the case of an emergency e.g. Oil spill)	Survey will be a maximum of 120 days. Seismic vessel will be limited to the extent of the Operational Area (except during transit between Operational Area and mainland and in the event of an emergency e.g. oil spill) Only support /chase vessels be used for OBN deployment/recovery operations
No predicted direct effect on EBPC Act listed MNES at a population level or to visual amenity	Restricted to behavioural changes by a small number of birds in the immediate vicinity of the vessel. Any effect of exposure is not expected to impact on migration or other behaviours (nesting/foraging), with no detectable effects at a population level. There are no other EPBC Act listed MNES predicted to be negatively affected by light emissions from the seismic or support/chase vessels. No more than possible incidental effects to seabirds in the local vicinity of the discharge or footprint of disturbance, and no impact on critical activities or habitats. No population or ecosystem level effects. Seismic vessel will be in constant motion and will remain within Operational Area which is >35 km from closest location on mainland and will therefore not impact visual amenity. Activity EMBA is well used in terms of existing commercial shipping and will not add a significant additional lighting burden.
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/objections, where required. No outstanding merited concerns	No specific stakeholder concerns have been raised concerning impacts of light emissions from vessels.

4.5.4 Environmental performance outcomes and standards

Table 4.20: Environmental performance outcomes and standards for light emissions

Environmental performance outcome	Environmental performance standard
Minimise potential for adverse impacts on light sensitive marine fauna	Non-essential lighting will be switched off when not in use.
	External lighting will be directed onto the deck, reducing light spill to the environment where practicable for safe operations.

4.6 Impact 6: Routine discharges – vessels

4.6.1 Description of impact

Seismic survey vessels routinely discharge putrescible wastes (food scraps), grey water (water from showers, laundries and dishwashing), sewage, deck drainage, bilge water, brine and cooling water. These discharges can potentially result in:

- Temporary localised decline in water quality in the immediate vicinity of the discharge
- Localised increase in biological oxygen demand
- Localised increase in turbidity of surrounding waters
- Temporary toxicity to marine flora and fauna (bilge water discharges)
- Temporary and localised increase in sea surface water temperature and sea surface salinity.

Deck drainage, comprising rainwater and deck wash-down water, may contain minor quantities of oil, grease and detergents that have been washed off the decks. Rapid dilution and the assimilative capacity of the offshore marine environment means the potential for toxicity from hydrocarbon residues is considered low.

Bilge water includes deck drainage that has been captured in a closed-loop system and engine spaced oil that is directed to the bilge water tank for removal of oil to ≤15 ppm oil-in-water (OIW) content prior to discharge.

A typical seismic vessel of the size required carries approximately 70 persons on board (POB), and support vessels approximately 15 POB. The volume of discharges during the survey are expected to be approximately 170 L/day/person (United States EPA 2011), yielding a total daily grey water volume of approximately 14,450 L for the crew of the seismic vessel and one support vessel. There is potential for phytoplankton uptake of the extra nutrients and localised, temporary increases in primary productivity. However, given the oligotrophic (nutrient poor) receiving waters, the temporary nature of the discharges in any one location, the small volumes and the rapid dilution and dispersion, no measurable increases in nutrient concentrations, oxygen demand, turbidity or plankton are expected.

Seawater is used as a heat exchange medium for cooling machinery engines and other equipment. Seawater is drawn up from the ocean, where it is de-oxygenated and sterilised by electrolysis and then circulated as coolant for various equipment through the heat exchangers, then discharged to the ocean above ambient temperatures. Turbulent mixing and heat transfer with surrounding waters will occur rapidly, causing very localised and temporary increases in water temperature. Impacts on marine organisms will be negligible given the buffering and dispersive capacities of the receiving seawater.

Brine (hyper-saline water) is created through the vessel's desalination process that creates freshwater. This is achieved through reverse osmosis (RO) or distillation; both processes resulting in the discharge of seawater with a slightly elevated salinity (approximately 10% higher than seawater). Brine water is denser than seawater and will sink through the water column which will aid rapid mixing with receiving waters and dispersion by ocean surface currents. The potential for adverse biological impact is considered negligible.

No effects on individuals or communities are expected for pelagic or benthic receptors. Any reduction in water quality would be extremely localised and temporary and is unlikely to have any measurable impact on species diversity or abundance within these areas. Fisheries and fish resources would not be affected. There are therefore no predicted effects to the Zeehan Marine Park conservation values nor to the West Tasmanian Canyons KEF. The Bonney Coast Upwelling KEF is 14 km to the north of the Operational Area at its closest point and any routine discharges from the vessel are not expected to travel such a distance due to MARPOL legislative requirements for discharging within 3 NM and 12 NM of the mainland and the well-mixed offshore waters of the Operational Area.

4.6.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). Those measures rejected as cost outweighing the benefit or not practical, are listed below.

Control measures rejected	Cost benefit analysis		
ALARP assessment technique – EIA			
Retain all waste streams on board to avoid discharging at sea.	Considerable additional storage to be provided on board, discounted due to disproportionate costs in retrofitting vessels, compared to small environmental benefit.		
Residual impact			
	Consequence	**Likelihood**	**Risk Ranking**
	Negligible	Remote	Low

4.6.3 Demonstration of acceptability

Criteria	Justification
Chemical toxicity and oxygen depletion impacts to fauna in the water column are minor, localised and temporary	Routine operational discharges result in and localised (within vicinity of discharge) minor reduction in water quality, which will be short-term due to the well-mixed marine waters of the Otway Deep Operational Area and deep oceanic waters (>170 m water depth).
The seismic survey is short-term and vessels do not operate outside of Activity EMBA (except for transiting to/from mainland to Activity EMBA and in the case of an emergency e.g. oil spill)	• Survey will be a maximum of 120 days. • Seismic vessel will be limited to the extent of the Operational Area (except during transit between Operational Area and mainland and in the event of an emergency e.g. oil spill) • Only support /chase vessels be used for OBN deployment/recovery operations
Vessel operations will be compliant with all maritime law relating to routine discharges from vessels.	Operations will be compliant with the MARPOL 73/78 and the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. Predictions are therefore considered acceptable because MARPOL requires seismic vessel to have a GMP in place, which if applied correctly will prevent accidental loss of solid objects.
No predicted direct effect on EBPC Act listed MNES at a population or ecosystem level	• There are no EPBC Act listed MNES predicted to be impacted by the potential impacts from routine vessel discharges. In addition, the Operational Area is located in deep oceanic waters (>170 m water depth). • No more than possible incidental effects to flora and fauna in the local vicinity of the discharge or footprint of disturbance, and no impact on critical activities or habitats. No population or ecosystem level effects. • Absence of areas of sensitive habitats susceptible to long-term effects, recovery of any areas disturbed with no medium to long-term effects on diversity. • No predicted effects to the Zeehan Marine Park or West Tasmanian Canyons or Bonney Coast Upwelling KEF conservation values.
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/ objections, where required. No outstanding merited concerns	No specific stakeholder concerns have been raised concerning impacts of routine discharges from vessel operations.

4.6.4 Environmental performance outcomes and standards

Table 4.21: Environmental performance outcomes and standards for routine vessel discharges

Environmental performance outcome	Environmental performance standard
Meet legislated discharge requirements for permissible discharges	Compliance with MARPOL 73/78 Annex IV (sewage) and Annex V (garbage), (as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983)); and AMSA Marine Orders – Part 96: Marine Pollution Prevention – Sewage, as required by vessel class: • Vessel will have a Garbage Management Plan (GMP) and Garbage Record Book • Treated sewage discharged >3 NM from land or untreated sewage discharge >12 NM from land and at a speed of greater than 4 knots • All food waste is macerated to ≤25 mm in size prior to overboard discharge, any discharge must be at a speed of greater than 4 knots • Operational on-board sewage treatment plant approved by the International Maritime Organization (IMO) • Operational on-board organic waste macerator compliant with MARPOL Annex V International Sewage Pollution Prevention (ISPP) Certificate
	All waste holding tanks are to be fully operational prior to survey commencement
	Vessel survey crew will be inducted in waste management and made familiar with the vessel GMP.
	Compliance with MARPOL 73/78 Annex I (as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983)); and AMSA Marine Order - Part 91 Marine Pollution Prevention – Oil): • oil content of any discharged water to be <15 ppm • bilge water contaminated with hydrocarbons must be contained and disposed of onshore, except if the oil content of the effluent without dilution does not exceed 15 ppm or an IMO approved oil/water separator (as required by vessel class) is used to treat the bilge water seismic vessel has an International Oil Pollution Prevention (IOPP) certificate.
	The vessel must not be stationary when undertaking discharge and oil in water (OIW) separator shut off value must be maintained and operational.
	Scupper plugs or equivalent drainage control measures are readily available to the deck crew so that deck drains can be blocked in the event of a hydrocarbon or chemical spill on deck to prevent or minimise discharge to the sea.
	Minor oil/lubricant spills will be mopped up immediately with absorbent materials that will be stored on board and disposed of onshore as hazardous waste in accordance with the vessel SOPEP.

4.7 Impact 7: Atmospheric emissions – vessels

4.7.1 Description of impact

Atmospheric emissions of greenhouse gases and other pollutants will be produced through:

- Combustion of marine diesel from the seismic and support vessel engines and fixed and mobile deck equipment during the survey
- Solid non-hazardous waste combustion within an incinerator, if logistics do not allow for the timely removal of waste from the vessel.

The main emissions that present an environmental impact include nitrous oxides (NOx), sulfur oxides (SOx), particulate matter <10 µm, non-methane volatile organic compounds (VOCs) benzene, toluene, ethylbenzene and xylenes (BTEX), greenhouse gases (predominantly carbon dioxide). These result in:

- Localised and temporary decrease in air quality due to emission of gaseous and particulate matter from diesel combustion
- Contribution to the global greenhouse gas (GHG) effect.

Atmospheric emissions will be localised within the immediate vicinity of the vessel within the survey area. Once in the atmosphere, the emissions will be rapidly dispersed and diluted and no measurable increase in air pollutant or GHG concentrations will occur. There will be no or very limited effect on ecosystems, species or habitats.

Given the short duration of the survey, and constant movement of the vessel, emissions from the combustion of fuel on board the vessels will not affect sensitive receptors in the vicinity of the survey area (including the health or amenity of the nearest human settlements).

4.7.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see EPOs and standards below). No measures were rejected as cost outweighing the benefit or not practical.

Residual impact			
	Consequence	Likelihood	Risk ranking
	Negligible	Remote	Low

4.7.3 Demonstration of acceptability

Criteria	Justification
Emissions from the seismic and support/chase vessels will result in localised temporary reductions in air quality with no loss of visual amenity	Emissions will be localised to the Operational Area and be rapidly dispersed and diluted in the atmosphere by the moving vessels.
No direct effect on EBPC Act listed MNES that is not recoverable at a population level.	• There are no EPBC Act listed MNES predicted to be impacted by the potential impacts from atmospheric emissions from vessels. • No more than possible incidental effects to flora and fauna in the local vicinity of the vessel, and no impact on critical activities or habitats. No population or ecosystem level effects.
The seismic survey is short-term, and vessels do not operate outside of Activity EMBA (except for transiting to/from mainland to Activity EMBA and in the case of an emergency e.g. oil spill)	• Survey will be a maximum of 120 days. • Seismic vessel will be limited to the extent of the Operational Area (except during transit between Operational Area and mainland and in the event of an emergency e.g. oil spill) • Only support /chase vessels be used for OBN deployment/recovery operations
Vessel operations will be compliant with all maritime law relating to atmospheric emissions from vessels.	Operations will be compliant with the MARPOL 73/78 and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. Predictions are therefore considered acceptable because MARPOL requires seismic vessel to use low-sulphur fuel, which if applied correctly will reduce harmful atmospheric emissions.
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/objections, where required. No outstanding merited concerns that are not being addressed	No specific stakeholder concerns have been raised regarding impacts of atmospheric emissions from vessels.

4.7.4 Environmental performance outcomes and standards

Table 4.22: Environmental performance outcomes and standards for atmospheric emissions

Environmental performance outcome	Environmental performance standard
Combustion systems comply with MARPOL VI (Prevention of Air Pollution from Ships) requirements.	Compliance with MARPOL 73/78 Annex VI and Marine Order – Part 97 (Part IIID Marine Pollution Prevention – Air Pollution with respect to vessels holding valid International Air Pollution Prevention Certificates and bunkering only low sulphur MDO grade fuel.
	Fuel usage will be monitored, and abnormally high consumption investigated in order to minimise excessive air pollution.
	All combustion equipment will be maintained in accordance with the PMS to ensure they are operating to design specifications.
	A MARPOL approved incinerator is used to incinerate solid waste
	Oil and other noxious liquids and solids will not be incinerated.

5 ENVIRONMENTAL RISK ASSESSMENT – UNPLANNED EVENTS

5.1 Risk 1: Physical interaction – collision or equipment entanglement with marine fauna

5.1.1 Description of risk

The survey and support / chase vessels may present a potential collision risk to large marine fauna such as whales, fur seals, dolphins and turtles that may be transiting through the Activity EMBA. The fauna that could occur in the Activity EMBA during the timing of the Otway Deep MSS include baleen and toothed whales (particularly during periods of upwelling), the Australian fur seal (shallow waters only) and transiting turtles. These fauna are mobile and would be expected to actively avoid the survey vessel. Damage and risk of injury is greatly increased at higher speeds, and is a higher risk when vessels travel at 14 knots or faster (Laist et al. 2001). However, an actively acquiring seismic vessel will acoustically announce its approach from distance and fauna are more likely to be aware and able to evade the slow-moving vessel. During seismic data acquisition, the survey vessel will be moving at a speed of approximately 4 to 5 knots, so the risk of lethal injury is lower than for most of the freighters transiting the area

Pygmy blue, southern right, fin and sei whales, as well as toothed whales (sperm whales, killer whales and dolphins) may be encountered in the Activity EMBA. The northern part of the Activity EMBA overlaps part of the pygmy blue whale foraging BIA, lies 2 km south of the southern right whale aggregation/calving BIA, and overlaps the known distribution/migration BIAs for both whale species. There is therefore the potential for encounters with whales during the foraging season (November to May) and southern right whales leaving the coastal aggregation/calving BIA. It is also possible that other species of whale could be encountered, particularly during periods of upwelling associated with the Bonney Coast, as cetacean surveys have identified other species (fin, sei, humpback) feeding in the coastal upwelling (Gill et al. 2015).

The Activity EMBA lies approximately 27 km from the nearest breeding colonies for the Australian fur seal but there are no BIAs for fur seals in the region.

Streamers within the Operational Area can present a potential risk of entanglement with marine fauna, and turtles have been known to become trapped in the tail buoys that are attached to the end of seismic streamers. However, not all tail buoy designs present a risk of entrapment. In the event of loss of a streamer self-inflating buoys are designed to bring the equipment to the surface where it can be retrieved by the seismic or support vessels. Recovery of streamers would be undertaken where safe and practicable to do so, which would remove the risk of faunal entanglement. Entanglement may cause minor disruption and temporary effects (days) on individual protected species, however no effects on critical behavioural processes are expected, and no threats at a population level.

Anecdotal sightings of marine turtles have been recorded during the summer and autumn months of the southern Australian coastline but there are no BIA within the Operational Area.

5.1.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). Those rejected as cost outweighing the benefit or not practical, are listed below.

Control measures rejected	Cost benefit analysis
ALARP assessment technique – EIA	
Reduce number of vessels in the field by not using support *v*essels	Reducing vessels used increases safety risk and reduces ability to manage stakeholder interactions, potential risks are higher than the benefits gained by implementing this control measure.

Control measures rejected	Cost benefit analysis
Remove streamers from water when not in use	It would increase health and safety risks and would prolong the overall individual activity time. Minimal reduction in risk of equipment loss/entanglement. Costs disproportionately higher than benefits.
No night-time operations	Limiting seismic activities to daylight hours only would significantly extend the time required to acquire data for individual activities. This would at least double the survey time and, therefore, increase the likelihood of interactions with diurnal fauna, the overall duration of seismic impacts, and interaction with commercial fisheries. Costs disproportionately higher than benefits.
No survey	Not practicable

Residual risk			
	Likelihood	Risk ranking	
	Remote	Medium – collision	Low - entanglement

5.1.3 Demonstration of acceptability

Criteria	Justification
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/objections, where required. No outstanding merited concerns.	No specific stakeholder concerns have been raised regarding vessel collisions with marine fauna.
Vessel operations will be compliant with all maritime law relating to cetaceans	Operations will be compliant with the EPBC Regulations 2000. Predictions are therefore considered acceptable because these Regulations provide separation distances between vessels and whales to mitigate risks collisions occurring.
No direct effect on EBPC Act listed MNES at a population level. No disruption of key ecological processes for key marine fauna values (migrating blue, humpback, fin and sei whales) of the Zeehan and Nelson Marine Parks (Australian IUCN Reserve Management Principle, Cat VI) No impact on the values of the Bonney Coast Upwelling (foraging pygmy blue whales) KEF. Aligns with the relevant management actions from the Conservation Management Plan for the Blue Whale: • 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, appropriate mitigation measures are implemented. Aligns with the relevant general recommendations of the Conservation Management Plan for the Southern Right Whale for reducing vessel speed or by separating vessels and whales Aligns with the relevant management actions from the Sei Whale Conservation Advice (DoEE 2015) and Fin Whale Conservation Advice (DoEE 2015b): • Ensure all vessel strike incidents are reported in the National Ship Strike Database.	Conservation Management Actions identified in the Management Plans and Conservation Advice for protected species (pygmy blue, southern right, sei and fin whales) to minimise vessel collisions are aligned with the control measures adopted in Section 4.1.6. Additional precautionary control measures described in Section 4.1.6 for early detection of whales prior coming into close physical contact with the seismic vessel afford protection to foraging and migrating pygmy blue whales, likely migrating sei and fin whales and migrating southern right whales when the latter leave their aggregation/calving BIA off Portland, VIC. No migratory BIAs/routes identified for humpback, sei, fin whales. There will be no direct effect on EBPC Act listed MNES at a population level

5.1.4 Environmental performance outcomes and standards

Table 5.1: Environmental performance outcomes and standards for collision or equipment entanglement with marine fauna

Environmental performance outcome	Environmental performance standard
No injury or death of marine fauna due to a vessel collision or entanglement with seismic streamers during the Otway Deep MSS	When streamer not deployed: the interaction of seismic and support vessels with cetaceans during the survey will be managed consistently with the Part 8 of the EPBC Regulations (2000)
	When streamer deployed, the seismic vessel will comply with EPBC Policy Statement 2.1 (Part A) to reduce the potential for marine fauna interactions, including the implementation of soft starts to encourage all large noise sensitive marine fauna to move away
	Use of streamer tail buoys fitted with appropriate turtle guards.
	Buoys and automatic recovery devices attached to streamer to facilitate recovery if lost
	Support vessel available to assist with recovery of lost streamers.
	Two trained MFOs on the seismic vessel watch for whales during daylight hours
	Seismic survey vessel will not travel at greater than 4-5 knots during seismic acquisition.
	Crews are inducted in their responsibilities as required regarding marine fauna interactions.
	All vessel strike incidents are reported in the National Ship Strike Database
	All threatened fauna injuries or death reported to the DoEE within 2 hours of the incident.
	All recovered entangled marine fauna returned to the sea as quickly as practicable.
	A seasonal exclusion area applies where the seismic vessel will not carry out seismic operations within the foraging area (annual high use area), known foraging area (variable use) BIA for pygmy blue whale foraging and additional 10 km noise buffer area, during the peak foraging month of February.
	In the event that there have been three or more whale-instigated power-down or shut-down situations during the preceding 24 hour period and the seismic vessel CANNOT move away from the current area and continue data acquisition in another area (>10 km away), Spectrum will implement additional precautionary control measures regarding increased pre-start up visual observation periods, increased soft-start, increased observation zones, increased low power zones and increased shut-down zone
	Relocate vessel after a shutdown to another area (>10 km away), if greater than 15 whales are present in observation zone during the pre-start observation, but not close enough to prevent soft start commencing (i.e. outside low power zone).
	Two trained Marine Fauna Observers (MFOs) on the seismic vessel and two trained MFOs on the cetacean monitoring chase vessel will watch for whales during daylight hours.
	Use of chase vessel with PAM and infra-red equipment on board and one PAM operator and two MFOs. Chase vessel will travel a distance of 10 km in front of the survey vessel and monitor for cetaceans.
	Towed PAM (with PAMGUARD) will be implemented during the survey when the acoustic source is operational.
	At the start of the survey during the daytime when there is sufficient visibility, PAM detection distances will be validated against the MFO observations to determine the level of accuracy of distance estimation to targets (vocalising whales) using PAM. PAM would be used to trigger mitigation responses during periods of low visibility and at night as follows: • If PAM records prove reliable in estimating distances (≤20% deviation), then PAM will be used to trigger low power and shut-down procedures at night and during periods of poor visibility when the whales enter the appropriate precaution zones. • If PAM records are shown to be inaccurate in estimating distances (>20 % deviation), the seismic vessel will shut-down in the event of a confirmed whale detection (comprising 2 or more detection records for an individual whale or the PAM operator is confident in species ID and distance estimation) and not commence soft-start procedures until 30 minutes has passed without further whale detection.
	Until PAM detection distances have been validated against MFO visual observation distances, during periods of low visibility and at night the seismic vessel will shut-down in the event of a confirmed whale detection (comprising 2 or more detection records for an individual whale or the PAM operator is confident in species ID and distance estimation) and not commence soft-start procedures until 30 minutes has passed without further whale detection.

Environmental performance outcome	Environmental performance standard
	The Survey Environmental Advisor (SEA) will monitor MODIS sea surface temperature (SST) and chlorophyll-a (Chl-a) heat maps on a daily basis. This monitoring information will be used to inform Spectrum's understanding of the region and when the upwelling season starts, and the link between SST/Chl-a, upwelling events and the presence of pygmy blue whales. The information will inform management measures for the following season's survey and interrogated to determine if there are any lags between upwelling events and whales seen/detected.

5.2 Risk 2: Introduction and establishment of invasive marine species

5.2.1 Description of risk

The following activities have the potential to lead to the introduction and establishment of invasive marine species (IMS):

- Discharge of ballast water from the seismic survey vessel
- Biofouling on vessel hulls and other external niches (e.g. propulsion units, thruster tunnels)
- Biofouling of vessel internal niches (e.g. sea chests, strainers, anchor cable lockers and bilge spaces)
- Marine biofouling of in water equipment (e.g. streamers, tail buoys).

Introduction and establishment of IMS through biofouling or ballast water discharge has the potential to result in potential effects to seabed habitat and marine ecosystems due to:

- Competition with native species for resources, reducing native species diversity and abundance
- Predation on local species.

The probability of successful establishment of IMS is dependent on several factors including survival of the propagules during their transfer to the area, the suitability of the environmental conditions at the recipient site, the survival of the propagules to reproductive state and the continued success of the introduced population. The Operational Area does not present a location conducive to IMS survival because it is located in deep oceanic waters (>170 m water depth). Establishment of IMS is mostly likely to occur in shallow waters (<50 m) in areas where large numbers of vessels are present and are stationary for an extended period.

5.2.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). Those rejected as cost outweighing the benefit or not practical, are listed below.

Control measures rejected		Cost benefit analysis	
ALARP assessment technique – EIA			
Use of freshwater ballast on board the survey vessel to inhibit survival of marine species.		Costs associated with this measure are high, and disproportionate to the benefit.	
Residual risk			
	Consequence	**Likelihood**	**Risk ranking**
	Negligible	Remote	Low

5.2.3 Demonstration of acceptability

Criteria	Justification
Vessel operations will be compliant with all maritime law relating to IMS	Operations will be compliant with the *Biosecurity Act 2015* and the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry. Predictions are therefore considered acceptable because the Act and national guidance mandates quarantine requirements and risk assessments for vessels to follow prior to entering Australian waters.
No direct effect on EBPC Act listed MNES at a population level.	There are no EPBC Act listed MNES predicted to be impacted by the risk of impacts from introduction and establishment of IMS.
No predicted direct effect on benthic habitats or communities at an ecosystem level.	The Operational Area within which the seismic vessel will confined (i.e. will not be used for the placement of OBNs) does not present a location conducive to IMS survival because it is located in deep oceanic waters (>170 m water depth).
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/objections, where required. No outstanding merited concerns.	No specific stakeholder concerns have been raised regarding IMS.

5.2.4 Environmental performance outcomes and standards

Table 5.2: Environmental performance outcomes and standards for introduction and establishment of IMS

Environmental performance outcome	Environmental performance standard
No introduction and/or establishment of IMS into Australian waters	• No planned ballast water exchanges to take place during the activity, but if required, ballast water exchange will occur >12 NM from land (with the exception of an exchange to maintain the stability of the vessel in an emergency) • No discharge of ballast water from survey and support vessels within 12 NM of land without prior authorisation from the DAWR. • Ballast water discharges recorded as >12 NM from land in Ballast Water Management Summary Sheet. • Adherence to Australian Ballast Water Management Requirements (DAWR, 2016) to meet the Australian requirements under the *Biosecurity Act 2015*.
	Survey vessel and support/chase vessel/s comply with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia 2009): • Biofouling Record Book kept outlining marine fouling management actions • Biofouling risk assessment shows low risk of IMS presence prior to entry into Australian waters Recent hull inspections (if required based on biofouling risk assessment) • Survey vessel has a certified anti-fouling coating on the hull and coating is in sound condition. Anti-fouling system certification is in place in accordance with AMSA Marine Order Part 98 (Anti-fouling systems).
	Routine cleaning and inspection of submersible equipment (airgun array, streamers, tail buoys), consistent with the requirements of the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia 2009).

5.3 Risk 3: Seabed disturbance – accidental loss of solid materials and emergency anchoring

5.3.1 Description of risk

Should a seismic streamer become detached from the survey vessel or drag on the seabed it has the potential to cause minor physical damage to benthic habitats. It is unlikely the streamer will drag on the seabed at it is maintained at a tow depth of <20 m below the sea surface (minimum depth of 170 m).

Non-hazardous and hazardous solid wastes may be released by accidentally dropping objects overboard due to human error, equipment failure or adverse weather. Smaller items lost overboard, or larger items as they break down, may be ingested by mobile fauna such as turtles and cetaceans. However, the probability of this material being accidentally released is remote given the vessel Garbage Management Plan is followed.

Under normal operations, no anchoring will be undertaken by any vessels within the survey area. Unplanned anchoring could occur in an emergency, resulting in localised disturbance to the benthic environment in contact with the anchor and anchor chain and/or disturbance to unmarked shipwrecks. There are no protected shipwrecks with exclusion zones within the Operational Area, however there are three historic wrecks (>75 years) without exclusion zones which have been mapped. There will be no emergency anchoring over the Western Tasmanian Canyons KEF, unless there is no other possible alternative, or the alternative compromises vessel or personnel safety.

In the event of loss of a seismic streamer / unplanned anchoring, potential environmental effects will be limited to physical disturbance of substrates, benthic habitats and communities in a localised area (i.e. immediate footprint of the disturbance), with only short-term effects on communities in the disturbance footprint and no effects on ecosystem function.

5.3.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see EPOs and standards below). No measures were rejected as cost outweighing the benefit or not practical.

Residual risk			
	Consequence	Likelihood	Risk ranking
	Minor	Remote	Low

5.3.3 Demonstration of acceptability

Criteria	Justification
The seismic survey will be short term	The Otway Deep MSS is planned for a maximum of 120 days (4 months) to account for weather, stakeholder interactions and marine fauna management; however, it is possible that it could be completed in a shorter space of time. Spectrum have selected a wide sail line spacing of 750 to 1,000 m which minimises the amount of time for the vessel to be operating within the area.
Vessel operations will be compliant with all maritime law relating to waste management	Operations will be compliant with the vessel's Garbage Management Plan (required under MARPOL 73/78). Predictions are therefore considered acceptable because MARPOL requires seismic vessel to have a GMP in place, which if applied correctly will prevent accidental loss of solid objects.
No direct effect on EBPC Act listed MNES at a population level.	There are no EPBC Act listed MNES predicted to be impacted by the risk of impacts from accidental loss of solid materials. In addition, the Operational Area is located in deep oceanic waters (>170 m water depth). No population level effects.

Criteria	Justification
No direct effect on West Tasmanian Canyons KEF values	Due to the depth of the sensitive areas of the KEF (200-350 m), only the loss of large objects (e.g. streamer) or emergency anchoring could potentially have any effect on the values of the KEF (sponge diversity). Streamers will be recovered through activation of floatation device and emergency anchoring will not occur over the KEF unless required for vessel/personnel safety.
No loss or disturbance to shipwrecks	No protected shipwrecks with exclusion zones within the Operational Area. Three known protected historic wrecks (>75 years) without exclusion zones have been mapped.
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/objections, where required. No outstanding merited concerns	No specific stakeholder concerns have been raised regarding seabed disturbance from equipment loss / emergency anchoring.

5.3.4 Environmental performance outcomes and standards

Table 5.3: Environmental performance outcomes and standards for seabed disturbance (accidental loss of solid materials)

Environmental performance outcome	Environmental performance standard
No loss or disturbance to benthic habitats due loss of equipment or emergency anchoring	Operational procedures followed for deployment and retrieval of towed equipment
	No planned anchoring during the survey unless in the event of an emergency.
	No seismic acquisition will occur in water <30 m depth
	Streamers equipped with Streamer Recovery Device
	Streamers not to be closer than 10m from the seabed at all time
	Lost streamer recovery procedure carried on board survey vessel
	Any lost equipment will be recovered where safe and practicable to do so
	In the event of emergency anchoring, all measures will be taken to avoid the canyon heads of the Western Tasmanian Canyons KEF, without compromising vessel or personnel safety
No loss or disturbance to benthic habitats due dropped objects	Compliance with MARPOL 73/78 Annex V and have a vessel GMP that must contain as a minimum waste handling equipment/storage and closed bins appropriate to the type and volume of waste.
	All waste receptacles covered to prevent any solid wastes from blowing overboard
	AMSA and AHS advised of the loss of large items of buoyant waste
	All large, bulky items are securely fastened at sea to prevent loss at sea.

5.4 Risk 4: Accidental release – hazardous materials and solid objects

5.4.1 Description of risk

There is potential for accidental loss of hazardous and non hazardous fluids through operator error, equipment leaks or machinery malfunction. Chemicals are stored in internal areas where any leak or spill would be retained (e.g. bunded) on board and cleaned up in accordance with the SOPEP and associated spill clean-up procedures. For a spill on deck to result in a release to the marine environment, there would need to be an un-confined spill that flowed overboard.

Given that the use of oils or other chemicals on deck would be largely confined to bunded areas, this is highly unlikely to occur and would require the failure of a bund or extreme weather conditions. The realistic worst-case spill volume would be 25 L (largest capacity container) should a chemical spill in an unconfined area eventuate in release to the marine environment, or a drum is compromised during handling. Hazardous wastes are stored in accordance with the vessel Garbage Management Plan.

Depending on the nature and volume , the discharge can result in a temporary localised decline in water and sediment quality and potential toxicity to marine fauna through ingestion, contaminated prey and contact .The survey area overlaps with the pygmy blue whale foraging and migratory BIAs, as well as the southern right whale migratory BIA. Due to the proposed timing of the survey from October to February, it is likely that pygmy blue whales could occur in the Activity EMBA. It is less likely that southern right whales would occur in abundance, preferring shallow coastal water (<10m).

Loss of a drum or other large container used for storage on deck could lead to a floating object (if buoyant) or debris on the seabed.

The survey is located in offshore waters 170 to 3,600 m deep therefore excluding shallow water. Given the likely volumes, oil and chemicals will rapidly evaporate/disperse and weather in the open ocean environment, till diluted to concentrations at which they are not harmful

5.4.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). Those measures rejected as cost outweighing the benefit or not practical, are listed below.

Control measures rejected	Cost benefit analysis		
ALARP assessment technique – EIA			
Below-deck storage of all hydrocarbons and chemicals	Access to chemicals and oils on deck is required during operations Chemicals would still need to be brought onto deck when required during operations. This measure was rejected as it would inhibit operations; costs outweigh benefits.		
A reduction in the volumes of chemicals and hydrocarbons stored on board the vessel	Chemical transfer during operations would be required, which has associated risks. Could also result in delays to operations Costs outweigh benefits due to additional risks associated with transfer of chemicals during the survey.		
Residual risk			
Residual risk	**Consequence**	**Likelihood**	**Risk ranking**
	Minor	Remote	Low

5.4.3 Demonstration of acceptability

Criteria	Justification
The seismic survey will be short term	The Otway Deep MSS is planned for a maximum of 120 days (4 months) to account for weather, stakeholder interactions and marine fauna management; however, it is possible that it could be completed in a shorter space of time. Spectrum have selected a wide sail line spacing of 750 to 1,000 m which minimises the amount of time for the vessel to be operating within the area.
Vessel operations will be compliant with all maritime law relating to hazardous materials management	Operations will be compliant with the MARPOL 73/78 and the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. Predictions are therefore considered acceptable because MARPOL requires seismic vessel to have a GMP and SOPEP in place, which if applied correctly will prevent accidental loss of solid objects and pollution events.

Criteria	Justification
No direct effect on EBPC Act listed MNES at a population level.	There are no EPBC Act listed MNES predicted to be impacted by the risk of impacts from accidental loss hazardous materials. In addition, the Operational Area is located in deep oceanic waters (>170 m water depth). No more than possible incidental effects to flora and fauna in the local vicinity of the discharge or footprint of disturbance, and no impact on critical activities or habitats. No population level effects. Absence of areas of sensitive habitats susceptible to long-term effects, recovery of any areas disturbed with no medium to long-term effects on diversity. No predicted effects to the Zeehan Marine Park or West Tasmanian Canyons or Bonney Coast Upwelling KEF conservation values.
Stakeholder concerns/objections received have been merit assessed and control measures developed to address merited concerns/objections, where required. No outstanding merited concerns	No specific stakeholder concerns have been raised regarding loss of hazardous or non-hazardous substances

5.4.4 Environmental performance outcomes and standards

Table 5.4: Environmental performance outcomes and standards for accidental release of hazardous materials

Environmental performance outcome	Environmental performance standard
Hazardous and non-hazardous wastes are stored, handled, disposed of and retrieved in a manner that prevents marine pollution.	Compliance with MARPOL 73/78 Annex V and have a vessel GMP
	Hazardous wastes materials are handled and stored in accordance with the corresponding MSDS.
	Vessel survey crew are inducted in waste management procedures and familiar with the vessel GMP.
	Solid streamer (or gel-filled), no fluid filled streamer to be used
Chemicals or oily wastes are stored, handled, disposed and cleaned up in a manner that prevents marine pollution.	Compliance with MARPOL 73/78 Annex I and AMSA Marine Order – Part 91 Marine Pollution Prevention – Oil) with respect to having a current Shipboard Oil Pollution Emergency Plan (SOPEP) in place and a valid IOPP certificate
	Chemicals and/or hydrocarbons on deck will be stored with a form of secondary containment measure to contain leaks or spills in accordance with their MSDS.
	Hydrocarbon and chemical storage areas are bunded and/or stored safely and drain to the bilge tank.
	Hazardous wastes materials will be handled and stored in accordance with the MSDS.
	All hazardous substances will be included in the Material Safety Data Sheet (MSDS) registers. These registers are available in key locations of the vessels and kept up to date
	Unused hydrocarbon and chemicals will be returned to suppliers or store for future use, unless needed by the next client
	Equipment located on deck utilising hydrocarbons will have as a minimum primary bunding
	Spills from fixed equipment are enclosed and captured via bilges that drain via the OIW separator.
	Minor oil/lubricant spills will be mopped up immediately with absorbent materials that will be disposed of onshore as hazardous waste in accordance with the vessel SOPEP
	Survey vessel crew are inducted in their responsibilities under the SOPEP and are competent in spill response and have appropriate response resources to prevent spills discharging overboard.
	Scupper plugs or equivalent drainage control measures are readily available so that deck drains can be blocked in the event of a spill on deck to prevent or minimise discharge to the sea.
	Spill response kits are available in relevant locations around each vessel, are fully stocked and used in the event of a spill to deck to prevent or minimise discharge overboard.

5.5 Risk 5: Accidental oil spill (refuelling)

5.5.1 Description of risk

If the refuelling hose was full and the entire contents were lost to the sea, this could result in a spill of approximately 125 L of diesel (a Level 1 spill scenario). Dry break couplings would prevent any more than the hose volume being spilled in the event of hose failure. In reality, a more likely scenario is that a minor leak from a damaged hose would be detected first and the situation rectified before the hose could burst.

In the event of a diesel spill, surface slicks and plumes of entrained hydrocarbons can cause a localised reduction in water quality and may have toxic effects on marine fauna and flora. ADIOS2 modelling infers that the surface slick would travel up to around 8 km before weathering makes the slick undetectable, which means it would not reach the coast from the Operational Area.

Commercial fishing and shipping in the area could potentially be affected for a short period (<5 h, based on ADIOS2 modelling) in the event of a diesel spill. Due to the water depth within the extent of a potential impact (within ~8 km of the Operational Area water depth is >50 m deep), the seabed is highly unlikely to be exposed to impacts from a 125 L instantaneous surface diesel release.

5.5.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). Those measures rejected as cost outweighing the benefit or not practical, are listed below.

Control measures rejected	Cost benefit analysis		
Avoiding refuelling at sea by bringing seismic vessel to port for refuelling	Costs disproportionate to the benefits gained		
Residual risk			
	Consequence	**Likelihood**	**Risk ranking**
	Negligible	Unlikely	Low

5.5.3 Demonstration of acceptability

Criteria	Justification
There will be no unrecoverable effects on EPBC Act Listed MNES	Should a spill occur, predictions from ADIOS2 indicate that an unmitigated surface slick resulting from an instantaneous 125 L diesel bunkering spill will persist for <5 hours, with a potential distance travelled during that time of up to 8 km. The vessel SOPEP will be implemented to mitigate risk. The risk of exposure at levels that may cause unrecoverable impacts to MNES is predicted to be unlikely, and therefore considered acceptable because: • the risk of interaction with the surface slick is low (small spatial area, restricted to surface waters, low spatial density of MNES) • levels of hydrocarbons with potential to cause ecological harm are not persistent because diesel rapidly spreads to a very thin sheen (e.g. it has a dynamic viscosity of 4.3 at 40°C) and will weather rapidly (<5 h).
Operations are compliant with maritime law	Operations will be compliant with MARPOL 73/78 Annex I (as applied in Australia under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983)), and AMSA Marine Orders – Part 91 Marine Pollution Prevention – Oil) – and therefore considered acceptable because these Acts and Orders provide marine pollution prevention measures to mitigate risks of spills occurring.

5.5.4 Environmental performance outcomes and standards

Table 5.5: Environmental performance outcomes and standards for an accidental fuel spill

Environmental performance outcome	Environmental performance standard
No oil spill in sensitive marine environments during the activity	Compliance with MARPOL 73/78 Annex I and AMSA Marine Orders – Part 91 Marine Pollution Prevention – Oil) with respect to having a current SOPEP and valid IOPP Certificate in place
	The SOPEP and OPEP are approved and tested prior to the survey vessel commencing acquisition (emergency response drills)
	Support vessel(s) will undertake surveillance (during a spill) and manage interactions with other marine users and vessels transiting near the seismic vessel or streamers
	Survey vessel only uses diesel fuel oil
	Responsibilities of survey crew under the OPEP and SOPEP are communicated to relevant personnel and included as part of the project induction
	All relevant crew trained in implementation of the OPEP and SOPEP
	Refuelling at sea subject to specific seismic vessel refuelling procedures e.g. communications, favourable weather/sea conditions, daylight hours, equipment inspections, supervision of mooring lines and job hazard analyses
	All re-fuelling equipment will be maintained in accordance with the PMS to ensure they are operating to design specifications

5.6 Risk 6: Accidental oil spill (vessel collision)

5.6.1 Description of risk

AMSA recommends that the maximum realistic spill scenario for vessel collisions or grounding is the loss of the entire volume of the single largest fuel tank (AMSA 2013). Vessels to be used for the Spectrum Otway Deep MSS have not yet been selected, and so an analogue survey vessel has been used for the purposes of assessing spill risk and identifying appropriate spill response strategies within the Operational Area (the MV Polar Empress). Consequently, the maximum realistic spill scenario within the Operational Area is based on the rupture of the largest fuel tank with a capacity of 391 m3 (a Level 2 spill scenario) of MDO. The total loss of fuel would be reduced by isolating the compromised fuel cell and transferring fuel to adjacent cells

Based on a review of the Australian Transport Safety Bureau's marine safety database there are no recorded instances of collisions, grounding or sinking of a seismic vessel or its support vessels in Australian waters in at least the last 30 years.

MDO has a low density, a low pour point and a low dynamic viscosity, indicating that this oil will spread quickly when spilled at sea and thin out to low thicknesses, increasing the rate of evaporation and dispersion. ADIOS2 modelling undertaken for diesel indicates with wind speeds at 7 m/s (the average wind speed in the area for the timeframe of the activity), 99% of the surface expression will evaporate or disperse within 27 hours.

Because of the nature of diesel to spread quickly to a thin surface layer, small amounts over a relatively large area will become entrained. As such, entrained oil at concentrations above the thresholds will be limited to a localised area around the source of the spill. The lighter fractions of the oil are typically more soluble (e.g. aromatic hydrocarbons), and these are generally also more toxic than the heavier fractions. Given the relatively small portion of soluble hydrocarbons present in diesel, along with their rapid decomposition, the percentage of spilled oil that will become dissolved in the event of a fuel spill is expected to be small.

Commercial fishing and shipping in the area could potentially be affected by the presence of a surface slick in the event of a diesel spill, while the degradation of water quality may result in impacts to marine habitats and communities and protected species through ingestion/breathing of toxic components and oiling.

Seabirds rafting, resting, diving, feeding at sea have the potential to come into contact with surface oil at various exposure levels. However, birds are not likely to be significantly impacted by in-water concentrations of hydrocarbons due to their limited exposure time in the water column. Given that surface exposures are expected to disappear within a short timeframe, it is not expected that large numbers of birds would be exposed to surface hydrocarbon levels that would result in impacts

No marine turtle BIAs (e.g. foraging, inter-nesting, mating and nesting) are recognised within the EMBA. Given the expected limited duration of the spill at the water surface and the infrequent occurrence of marine turtles in the EMBA, impacts to marine reptiles are expected to be minimal.

The Bonney Upwelling is described as a productivity hotspot with high densities of zooplankton, an important food source for fish and whales Any impacts of a diesel spill to planktonic communities in the pelagic environment would be of short duration given the rate at which the spill would disperse and weather and the dynamic nature of planktonic communities (Davenport et al. 1982). Given the expected limited duration of the spill and the variability in plankton populations in both space and time, impacts to marine plankton are generally expected to be limited. However, consideration must be given to the importance of coastal krill in the blue whale food chain.

The southern bluefin tuna is not listed on the protected matters report, but is a commercially important, highly migratory species that could be encountered within the EMBA but unlikely to occur in the Operational Area.

The EMBA supports internationally significant populations of numerous marine mammals. The PMST report identified one threatened pinniped species, the Australian sea lion (Neophoca cinerea), that may potentially occur within the EMBA The PMST report identified 10 marine cetacean species listed as ‘threatened’ and/or ‘migratory’ MNES under the EPBC Act that may potentially occur within the EMBA. These consist of seven mysticete (baleen) whale species and three odontocete (toothed) species. NCVA showed that two of these species have BIAs defined within the EMBA (the pygmy blue whale and the southern right whale).

5.6.2 Demonstration of ALARP

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). No measures were rejected as cost outweighing the benefit or not practical.

Residual risk			
	Consequence	Likelihood	Risk ranking
	Minor	Unlikely	Low

5.6.3 Demonstration of acceptability

Criteria	Justification
There will be no unrecoverable effects on EPBC Act listed MNES	Should a spill occur, the OPEP will be implemented to mitigate risk. The risk of exposure at levels that may cause unrecoverable impacts to MNES is predicted to be low due to the rate of weathering, spreading out of the surface slick, and limited vertical distribution of dissolved and entrained components into surface waters. This risk is therefore considered to be acceptable because: • Vessel operations are a well understood and practiced activity • There are multiple barrier levels in place to mitigate risk of a vessel collision and subsequent hydrocarbon release • Should there be a spill, the risk of interaction with the surface slick is low (relatively small spatial area, restricted to surface waters, low spatial density of MNES) • Levels of hydrocarbons with potential to cause ecological harm are likely to be spatially restricted, spatially transient and not persistent because diesel rapidly spreads to a very thin sheen (e.g. it has a dynamic viscosity of 4.3 at 40°C), will be moved with winds and tides, and will weather rapidly (99% weathered/dispersed in ~27 hours) • Although there is potential for shoreline exposure at King Island, the chance of this is extremely low based on the modelled maximum distance travelled by a surface slick (before it is 99% weathered). In addition, the shorelines at potential risk of exposure would be on the very south-western tip of King Island, which is comprised of rocky cliffs and bays, with only one sandy beach. It is also a minimum of 25 km from the northern half of King Island, which is a known important nesting/breeding area for seabirds and shorebirds.

Criteria	Justification
Operations are compliant with maritime law	Operations will be compliant with: • MARPOL 73/78 Annex I (as applied in Australia under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983)) • AMSA Marine Orders – Part 91 Marine Pollution Prevention – Oil) • Marine Orders Part 30: Prevention of Collisions (Issue 8) • Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 8, specifically the use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). Predictions are therefore considered acceptable because these Acts and Orders provide marine pollution prevention measures to mitigate risks of spills occurring.

5.6.4 Environmental performance outcomes and standards

Table 5.6: Environmental performance outcomes and standards for an accidental oil spill (vessel collision)

Environmental performance outcome	Environmental performance standard
No oil spill in sensitive marine environments during the activity	Compliance with MARPOL 73/78 Annex I (as applied in Australia under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983)); and AMSA Marine Orders – Part 91 Marine Pollution Prevention – Oil): • Current SOPEP in place • Survey, supply and chase vessels hold a valid IOPP Certificate, where required, under vessel class
	Survey, supply and chase vessels will be compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 8, specifically the use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights)
	The SOPEP and OPEP are approved and tested prior to the survey vessel commencing acquisition (emergency response drills) and can be implemented in the event of a spill
	The Australian Hydrographic Service (AHS) advised of the survey details (survey location, timing) four weeks prior to mobilisation and following demobilisation for issue of Notice to Mariners
	AMSA's RCC will be advised of the survey vessel's details, satellite communications details, area of operation and requested clearance from other vessels. This information will be notified to AMSA RCC 24 to 48 hours before operations commence
	AMSA RCC will be notified at the end of the survey when operations have been completed
	Support and/or chase vessel will undertake surveillance during a spill and at all times when streamers are deployed to manage interactions with other marine users and vessels transiting near the seismic vessel or streamers
	Support vessel present with the survey vessel at all times whilst seismic streamers are deployed
	Survey, supply and chase vessels only use marine diesel fuel oil
	Responsibilities of survey crew under the OPEP and SOPEP are communicated to relevant personnel and included as part of the project induction
	All relevant crew trained in implementation of the OPEP and SOPEP
	Survey, supply and chase vessels to maintain appropriate lighting, navigation and communication at all times to inform other users of the position and intentions of the survey vessel, in compliance with the Navigation Act 2012 and Chapter 5 of the SOLAS Convention
	Continuous (24 hour) survey operations, with survey team and bridge crew monitoring vessel position and depth at all times during seismic acquisition

5.7 Risk 7: Oil spill response

5.7.1 Description of risk

In the event of an oil spill, a number of potential responses may be initiated; dependent on advice from the Control Agency, the location and size of the spill, the potential for sensitive environmental receptors to be impacted and the resources available. These responses generally involve additional vessels and may involve equipment and field survey teams. These extra activities introduce additional risks to environmental receptors, as well as increasing the likelihood of many of the risks assessed within this EP.

The following response strategies have been considered for the two credible spill scenarios (Level 1 and 2):

- Monitor and evaluate
- Mechanical dispersion
- Containment and recovery
- Shoreline protection
- Shoreline clean-up
- Chemical dispersion.

The additional activities associated with a hydrocarbon spill response introduce additional risks to marine fauna and habitats, as well as increasing the likelihood of many of the impacts and risks already described within this EP. Examples of additional risks may include:

- Increased risk of disturbance of seabirds/shorebirds/marine megafauna or risk of vessel strikes
- Introduction of chemical control agents into the marine environment
- Increased potential for toxicity in surface waters (increased water-accommodated fraction) due to application of dispersants (if the oil is amenable to dispersion)
- Physical damage to shallow subtidal MNES from anchoring of shoreline protection booms
- Damage to sensitive intertidal habitats and food resources due to trampling, vehicles, cropping, removal of oiled sediment, hot water/jet washing, chemical control agents/dispersants.

5.7.2 Demonstration of ALARP

Response actions will be based on a Net Environmental Benefit Analysis (NEBA) or Spill Impact Mitigation Assessment (SIMA) approach, which will be used to consider the advantages and disadvantages of the different spill response options to determine if there would be a net environmental benefit or dis-benefit resulting from the implementation of a particular response in comparison to an unmitigated spill response strategy. NEBA/SIMA considers the hydrocarbon type, the sensitivities of the regional area of the spill, and the potential effects (positive and negative) of the proposed response strategy.

NEBA/SIMA is used for preliminary assessment to determine the initial spill responses required. In the actual event of a spill, the NEBA/SIMA is revisited regularly as more information becomes available e.g. on actual conditions, spill trajectory path and locations of sensitive receptors; and/or where a significant change in risk has been identified. This review process allows response strategies to be dimensioned to the nature and scale of the actual incident to provide optimal results.

A number of control measures have been adopted as reducing the risk to ALARP (see Environmental Performance Outcomes and Standards below). No control measures were rejected as cost outweighing the benefit or not practical.

Residual risk			
Residual risk	Consequence	Likelihood	Risk ranking
	Minor	Unlikely	Low

5.7.3 Demonstration of acceptability

Criteria	Justification
Spill response strategies will have been selected following an assessment of their potential benefits and/or dis-benefits using an industry-standard approach (i.e. NEBA Or Spill Impact Mitigation Assessment (SIMA))	Spill response strategies will be assessed using NEBA/SIMA before implementation. This allows assessment of response strategies against each other, and in comparison, to an unmitigated spill impact. The process will be continuously implemented throughout the response. This risk is therefore considered to be acceptable because: • Spill response strategies would have been assessed for the potential to increase risk to environmental sensitivities • There is a process in place that allows re-assessment following identification of a significant change in risk.
There will be no unrecoverable effects on EPBC Act listed MNES	Should a spill occur, the OPEP will be implemented to mitigate risk. The 'Monitor and Evaluate' strategy will be implemented as soon as reasonably practicable after the release. Oil Spill Trajectory Modelling (OSTM) will reduce uncertainty in response and be used to focus response efforts. OSTM will be ground-truthed using on-site vessel or aerial observations. Spill response equipment on site will be used to respond in the first instance (under the direction of AMSA as Control Agency), whilst other response resources are mobilised to the field. This risk is therefore considered to be acceptable because: • Vessel operations are a well understood and practiced activity • SOPEP responsibilities will have been covered in vessel inductions • The response will be managed and implemented by an experienced government response organisation specialised in vessel-based spills that has trained responders, provides spill response advice, contributes to spill response exercises, and has responded to numerous spills • 'Monitor and evaluate' and Operational monitoring will provide situational awareness and support identification of risks and protection priorities • Spill response waste will be removed from the environment and disposed of appropriately.
Operations are compliant with maritime law	Operations will be compliant with: • MARPOL 73/78 Annex I (as applied in Australia under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983) • AMSA Marine Orders – Part 91 Marine Pollution Prevention – Oil • Marine Orders Part 30: Prevention of Collisions (Issue 8) • Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 8, specifically the use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). • Predictions are therefore considered acceptable because these Acts and Orders provide marine pollution prevention measures to mitigate risks of spills occurring.

5.7.4 Environmental performance outcomes and standards

Table 5.7: Environmental performance outcomes and standards for oil spill response

Environmental performance outcome	Environmental performance standard
Spill response arrangements to minimise impacts to the environment implemented in accordance with the vessel SOPEP and OPEP in this EP	In the event of an oil spill, the Survey Vessel Master will implement available controls and resources of the SOPEP
	Response actions will be based on a Net Environmental Benefit Analysis (NEBA/SIMA) approach agreed with AMSA
	Notifications in the event of a Level 1 or Level 2 spills will be carried out

Environmental performance outcome	Environmental performance standard
	The Survey Vessel Master is responsible for notification (verbal) of a spill to the sea to the AMSA RCC and reporting
	Commercial and recreational fishers and other users in the area would be advised of any large spill and associated response activities via Spectrum's 24-hour 'look-ahead' correspondence
	Support vessels undertaking the MSS are used as vessels of opportunity to monitor the spill (operational monitoring) if safe to do (as agreed with AMSA)
	On-call Scientific monitoring response service agreement

6 IMPLEMENTATION STRATEGY

6.1 Otway deep MSS environmental management system

The Otway Deep MSS will be conducted under the framework of Spectrum's Environment Policy, Regulatory Compliance Procedure and HSE Management System (HSE MS). Each vessel will also operate under a vessel-specific HSE MS as well as a project-specific HSE plan that Spectrum and the vessel operators will develop for the Otway Deep MSS. The Otway Deep MSS HSE Management Plan (Project HSEMP) details how the project specific HSE aspects will be addressed under Spectrum's overarching policy and management system arrangements, and will referencing the performance standards and commitments made in this EP.

The Project HSEMP is a tailored document that ensures Spectrum's environmental management standards and intended performance outcomes are achieved at operational level throughout the activity, while identifying and enabling the selected seismic contractors' own procedures to be utilised where appropriate; for example, for specific vessel operational controls. At all times, however, the seismic contractor will be required as a minimum to comply with all relevant requirements of Spectrum's HSE policies and standards. The Project HSEMP includes procedures for the following:

- Emergency response
- Waste management
- Hazardous materials and handling
- Fuel/oil spills
- OBN deployment and recovery.

Spectrum and its vessel contractors will apply a tiered approach to optimising the environmental performance of the project and ensuring that Spectrum's environmental performance outcomes and standards are achieved. This approach involves identification of local and regional environmental sensitivities, prioritisation of risks, determination of appropriate practices and procedures to reduce those risks, and clear designation of roles and responsibilities of personnel for implementation.

The vessel contractors HSE documentation will be reviewed for compliance with the relevant requirements described in this EP prior to the commencement of the activity. In the event of a gap between the existing plans and procedures and the requirements of this EP, a bridging document will be developed to ensure all control measures are adequately covered in the implementation of the EP.

Relevant Spectrum and seismic vessel contractor procedures/plans for the Otway Deep MSS include:

- Spectrum HSE policy
- Spectrum regulatory compliance procedure
- Otway deep MSS HSE management plan
- Seismic vessel ship oil pollution emergency plan
- Seismic vessel shipboard safety procedures manual
- Seismic vessel shipboard safety management manual
- Seismic vessel safety operations manual
- Seismic vessel ballast water management plan

- Seismic vessel emergency response manual
- Seismic vessel garbage management plan
- Seismic vessel streamer deployment and recovery procedure
- Seismic vessel refuelling procedure
- Seismic vessel emergency preparedness procedure (drills and exercises)
- This EP.

6.1.1 Management of change

Management of change (MoC) is the transparent process for identifying, assessing, controlling and documenting any changes in the activity, or in the circumstances under which it is being implemented, which have the potential to increase or change the level of risk or impact, beyond those detailed in the accepted EP in force.

6.1.1.1 Triggers for MOC

Any changes to the activity, 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. If there is a predicted increase in risk in environmental impact or risk, the activity must cease. If additional controls can be implemented that will allow Spectrum to reduce the impacts and risks to ALARP and an acceptable level, then they can be implemented, and the activity can recommence. If however; the risk is significantly increased, even with additional controls and the impacts and risks cannot be demonstrated to be acceptable, the activity cannot recommence, and the EP must be revised. Similarly, if a significant modification or new stage of the activity is identified, which is not addressed in the accepted EP, the EP must be revised.

If any of the following types of changes are identified, the MoC process will be implemented:

- New hazards or risks, e.g. stakeholder with new meritorious issues, gazetting of a new marine park
- New stage of activity required e.g. significant extension of timeline required to complete acquisition
- Reduced ability to effectively implement the EP to meet stated performance standards
- Incremental change in the activity increasing the risk of significant impact.

6.1.1.2 Originator of MOC

All personnel involved in the survey and Spectrum staff managing the survey are required to be vigilant for potential changes to the activity with potential for affecting the risk and impact profile, or which may cause deviation from the accepted EP. This process is facilitated by Spectrum's Regulatory Compliance Procedure which includes a Compliance Matrix in which regulatory conditions relevant to the EP will be listed. Potential MoC triggers shall be reported immediately to the Spectrum Project Manager.

Spectrum will undertake a review of this EP to ensure that any changes to legislation, science, stakeholder requirements or other management requirements are fully accounted for and assessed every 6 months following approval and 1 month prior to commencement of the survey. This review will also ensure that the environmental impacts and risks of the activity continue to be identified and reduced to a level that is ALARP.

During the pre-survey planning and review process, changes to commercial fishery license areas, fishery status, fishing effort and licence holders overlapping the Activity EMBA will be identified by a review of current fisheries status reports, liaison with Commonwealth and state fisheries departments, and information provided by fishers and relevant industry representatives.

Spectrum will carry out a stakeholder identification process two months prior to the commencement of the survey to determine if there are any new relevant persons that may be affected by the activity. In the event of identification of new relevant stakeholders, Spectrum will follow the process described for the ongoing consultation. If new and/or existing stakeholders raise new issues that have the potential to significantly increase the risk of interference with the stakeholders' interests, Spectrum will trigger the MoC process described below.

6.1.1.3 MOC process

Once potential changes have been identified that trigger a MoC, the following steps will be initiated and documented:

- Stop work, or delay commencement of new activity
- Establish risk assessment team and advise Spectrum project manager
- Initial risk and impact assessment by the EP assessment team, using the same procedures as outlined in Section 3. This will determine if the increase in risk is significant and would therefore trigger a requirement to revise and resubmit the EP
- If resubmission required, work or new activity to be suspended until revised EP is accepted by NOPSEMA
- If resubmission not required, conduct and document detailed risk and impact assessment
- Consult stakeholders if changes may affect their activities or interests (based on previous feedback)
- Develop any additional control measures required to reduce risks and impacts to ALARP and ensure they are acceptable
- Update EP implementation strategy as necessary
- Develop EP Addendum documenting
  - The MoC process followed
  - Risk and impact assessment undertaken
  - Rationale for conclusions on residual risk
  - Stakeholder feedback
  - Additional control measures
  - Demonstration of ALARP and justification for acceptability
  - Revised performance standards, measurement criteria, responsibilities for each revised or new control measure
  - Confirmation that all sections of EP have been checked to ensure any potential deviations from the accepted plan have been captured and addressed.

6.1.1.4 Approver of MOC outcomes

Work on new or modified activities that do not trigger an EP resubmission will only recommence on the authority of the Spectrum Project Manager.

6.2 Environmental performance monitoring and evaluation

6.2.1 Review of environmental performance

Spectrum will monitor the performance of the control measures during the activity in line with the Project HSE Plan. Environmental performance during the survey will be reviewed to ensure that:

- EPOs and EPSs are being met, reviewed and where necessary amended (to continue to reduce the environmental impacts and risks of the activity to ALARP).
- Potential non-compliances and opportunities for continuous improvement are identified and corrective actions implemented.
- All environmental monitoring requirements have been met before completing the activity.

The following arrangements will be established to review the environmental performance of the activity:

- Inspections of the vessels will be carried out before and during the survey to ensure that procedures and equipment for managing routine discharges and emissions are in place to enable compliance with the EP.
- The performance of key equipment as described in this EP will be checked at least weekly to ensure ongoing reduction of risks and impacts to ALARP, and any potential issues are continually monitored and raised as soon as practicable.
- A summary of the EP commitments will be compiled in the Otway Deep MSS Compliance Register, which will be distributed aboard the survey vessel. Implementation of the all commitments will be monitored by the Spectrum Client Site Representative.

Any non-compliance with the EPS outlined in this EP will be subject to investigation and follow-up action.

Spectrum will also undertake an internal review of the environmental performance of the Otway Deep MSS at the conclusion of the survey. The review will consider:

- An evaluation of conformance with the Compliance Register
- Improvements to the implementation strategy included within the EP
- Compliance with the Project HSE Plan, Spectrum's HSE MS and the seismic vessel's HSE MS
- The management of any non-conformances identified during the survey, including reportable and recordable incidents
- Any concerns identified by stakeholders during and after the completion of the survey, followed by appropriate liaison as required
- Outcomes of any NOPSEMA audit reports and feedback.

6.2.2 Cetacean monitoring procedure

Spectrum will develop a detailed procedure for cetacean monitoring activities undertaken by the chase vessel and seismic vessel, which will include communication protocols between all vessels in the event the chase vessel ceases monitoring activities and leaves the survey area. The procedure will outline the procedures and protocol requirements to be implemented during the Otway Deep MSS. This procedure clarifies:

- The authority of individual MFO/PAM/TI to instigate a delay to soft start or power down/shut down event

- Required communications between seismic and cetacean monitoring vessel (chase vessel)
- Actions when a confirmed whale species is detected within a mitigation zone
- Actions when an unconfirmed whale species is detected and/or is not within a mitigation zone
- Actions when a marine mammal is detected by PAM and MFOs.

6.2.3 Monitoring, auditing and management of non-compliance

6.2.3.1 Monitoring and record keeping

Spectrum will maintain a quantitative record of emissions and discharges as required under Regulation 14(7) of the OPGGS(E). This record will include all emissions and discharges to the air and water and can be monitored and audited against the environmental performance standards. Table 6.1 outlines the proposed monitoring, auditing and reporting program that will be implemented for the Otway Deep MSS.

Table 6.1: Summary of environmental monitoring and reporting for the Otway deep MSS

Environmental aspect or activity	Monitoring	Record keeping	Reporting
Underwater noise from operation of the seismic source	Adherence to EPBC Policy Statement 2.1 Part A Standard Management Procedures and specific Part B Additional Management Procedures Application of defined precaution zones	Start-up delays, power downs or stop work procedures instigated as a result of cetacean sightings	MFO final report If incident breaches relevant EPO or EPS – recordable environmental incident If incident involves injury or death to EPBC listed species – reportable environmental incident Post-survey Environmental Review Report
	Marine fauna sightings	Cetacean sighting records (CSA database) Turtle sightings	MFO final report Post-survey Environmental Review Report
	Passive Acoustic Monitoring	PAM records of all marine fauna detections PAM validation exercise	MFO final report Post-survey Environmental Review Report
Light generation from survey vessel	Assessments of whether lighting is at minimum level required for safe operation and navigation	Records of periodic assessments by Vessel Master, or delegate	Post-survey Operations Report (internal)
Vessel and towed equipment interactions with marine fauna	Any interactions between marine fauna and seismic, support and/or chase vessels Any incidents involving turtle entanglement in tail buoys	Support vessel/towed equipment and marine fauna interaction records (bridge daily logs and MFO records)	If incident involves injury or death to EPBC listed species – reportable environmental incident If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report
Deployment and retrieval of anchors in the event of an emergency	No planned anchoring	Bridge daily logs	If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report
Deployment and retrieval of ocean bottom nodes (OBNs)	Deployment location Number of OBNs deployed Any incidents involving entanglement of OBN deployment lines with marine fauna or fishing equipment Attempts to recover lost OBNs	Bridge daily logs – support vessel	If incident involves entanglement (e.g. with marine fauna or fishing equipment) during deployment), or loss of an OBN unit – recordable environmental incident If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report

Environmental aspect or activity	Monitoring	Record keeping	Reporting
Equipment damage, dragging or loss	Impacts to seabed through damage, dragging or loss of towed seismic array Attempts to recover lost equipment	Bridge daily logs	If incident involves loss of a streamer and associated equipment – recordable environmental incident If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report
Discharge of ballast water from survey vessel	Volumes of non-routine ballast water discharges	Ballast water record book/summary	Post-survey Operations Report (internal) If incident breaches relevant EPO or EPS – recordable environmental incident
Biofouling (IMS) of survey or support vessel hulls and other niches	Management of biofouling	IMS risk assessment report or inspection records Anti-foulant treatment records/certification for survey and support vessels Records of survey and support vessel movements immediately prior to the Otway Deep MSS	If incident breaches relevant EPO or EPS – recordable environmental incident If incident involves the selected seismic vessel identified as high-risk following biofouling risk assessment and commences operations within the survey area without one or more of the following being undertaken; vessel inspection, hull cleaning and/or anti-foulant application – reportable environmental incident
Discharge of sewage, grey water and putrescible wastes	Discharge location Quantities discharged Discharge parameters (vessel speed; discharge rate)	Engine room logs	Post-survey Operations Report (internal) If incident breaches relevant EPO or EPS – recordable environmental incident
Discharge of bilge water	Discharge location Quantities discharged Treatment of potentially contaminated water prior to discharge	Engine room logs	Post-survey Operations Report (internal) If incident breaches relevant EPO or EPS – recordable environmental incident
Treatment/ disposal of other wastes e.g. garbage, oily sludges	Quantities of wastes incinerated aboard survey vessel or transferred to shore for treatment, recycling or disposal	Engine room logs Garbage record books Oil record books Incident reports	Post-survey Operations Report (internal) If incident breaches relevant EPO or EPS – recordable environmental incident
Accidental discharge of hazardous materials	Discharge location Quantities and types of materials accidentally discharged Attempts to recover lost objects	Bridge daily logs Incident reports	Release/discharge >80 L – reportable environmental incident (external – NOPSEMA) If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report
Oil spills (refuelling or vessel collision)	Any incidents involving vessel collisions Spill location Volumes of fuel/oil spills Spill response activities Communications with other marine users in the Operational Area	Bridge daily logs Bunkering records Communication logs Type I Operational Monitoring records – vessel visual observations of surface slicks; GPS tracking data; RPS APASA outputs; GIS mapping Type II Scientific Monitoring records as appropriate	Spill >80 L – reportable environmental incident If incident involves an oil spill leading to acute or chronic effects on, or smothering of, marine fauna and/or habitats – reportable environmental incident If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report Incident report (including SITREP and POLREP) to AMSA

Environmental aspect or activity	Monitoring	Record keeping	Reporting
Interaction with commercial fisheries	Any incidents involving negative interactions with commercial fishing vessels communications with other commercial fishers in the area Communications with commercial fishers in the Operational Area	Bridge daily logs Communication logs	If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report If incident involves damage to commercial or recreational fishers' gear within the survey area or other negative interactions – reportable environmental incident
Interaction with shipping	Any incidents involving negative interactions with commercial shipping Communications with other marine users in the Operational Area	Bridge daily logs Communication logs	If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report
Operation of survey and support vessels within protected areas or heritage places	Any incidents involving detrimental impacts to the conservation values of the Zeehan Marine Park	Bridge daily logs Communication logs with DoEE	If incident breaches relevant EPO or EPS – recordable environmental incident Post-survey Environmental Review Report
Training	Details of crew environmental inductions	Induction attendance record sheets Induction materials	Internal Post-survey Environmental Review Report
Incident reporting	Number and details of environmental incidents	Spectrum HSE incident reports	Internal Post-survey Environmental Review Report
Compliance reporting	Compliance with EPOs, EPS' and commitments listed on the Environmental Commitments Register	Completed environmental inspection/audit check sheet	Internal Post-survey Environmental Review Report

In accordance with Regulation 27 of the OPGGS(E), Spectrum will store and maintain all versions of the EP and documents or records relevant to the EP implementation for a period of five years.

6.2.3.2 Audits and inspections

Under Spectrum's Regulatory Compliance Procedure, an Environmental Compliance Register (ECR) listing all regulatory conditions described in this EP will be maintained and serve as an audit tool. The ECR will be sufficiently detailed to demonstrate that the Environmental Performance Outcomes and Standards included in this EP have been met.

Prior to the survey, Spectrum will undertake:

- A vessel audit/inspection to confirm that the vessel management systems are consistent with the environmental management controls detailed in this EP
- A review of the risk of IMS, potentially including an inspection to confirm that the vessel does not pose an unacceptable risk of IMS
- An audit of the on-board spill response capability of the seismic vessel against its SOPEP and relevant controls in this EP, to verify spill preparedness.

Compliance will be monitored on a regular basis by the onboard Survey Environmental Advisor (SEA) and HSE Representative, or delegate, via mechanisms including inspections, audits and feedback from crew. Compliance auditing or inspection during the Otway Deep MSS will be based on the Compliance Register and will target the following:

- Compliance with regulatory requirements detailed in this EP
- Management strategies and procedures to ensure epos and EPS' are being implemented, monitored, measured and evaluated
- Emissions and discharges are being monitored, measured and documented.

The frequency of inspections and audits shall be stated in the Project HSEMP and will include weekly inspections led by the SEA. Any non-compliance with the EPS outlined in this EP will be subject to investigation and follow-up action.

The findings and recommendations of audits/inspections will be documented and distributed to relevant personnel for comments. It is likely that inspections and audits will result in recommendations for improvement opportunities. The audit or inspection may also identify breaches in environmental performance. Any non-compliance is noted and communicated immediately to the Client Site Representative and the Party Chief, as well as being documented in the audit or inspection report.

HSE performance of the survey will be discussed within Spectrum during daily management phone calls between the vessel and head office, and weekly during on-board HSE meetings.

The environmental inspection results will be included with the PERR submitted to NOPSEMA after completion of the survey.

6.2.3.3 Management of non-compliance

All EP non-compliance issues will be communicated immediately to appropriate offshore and onshore management personnel. This expectation will be reinforced at inductions, daily toolbox meetings and weekly HSE meetings. The SEA is responsible for recording all non-compliances in Spectrum's Central Action Tracking Register and ensuring that associated corrective actions are tracked to completion within agreed time frames by the delegated person. This process is overseen by the Spectrum Project Manager at both a project and company-wide level.

Onboard incidents (and near misses) shall be investigated in accordance with vessel contractor's and Spectrum investigation procedures. Project specific incident reporting requirements will be detailed in the ECR. Non-compliances identified during an audit will be listed in the audit report issued by the auditor to the Project Manager, who will then generate a corrective action request. The corrective action will specify the remedial action required to fix the breach and prevent its reoccurrence. The corrective action will be closed only when the remedial action has been verified by the Vessel Master and signed off.

Non-compliances and corrective actions are communicated to the offshore crew during daily toolbox meetings before each shift and at weekly HSE meetings on board the vessel and implemented if appropriate.

Spectrum will carry forward any non-compliance identified during the project for consideration in future marine campaigns to assist with continuous improvement in development of appropriate control measures and environmental performance outcomes and standards. When planning future activities, Spectrum will also review the reportable and recordable incidents that have occurred previously to incorporate any lessons learned as part of Spectrum's continual improvement process.

At all times during the survey the Spectrum Client Site Representative will be on board the survey vessel. The Spectrum representative has the authority to stop work at any time. Survey operations will be suspended if there is a non-compliance that increases the risk of significant negative impacts to the environment and the Spectrum representative (or other authorised person) is not satisfied that measures are in place to avoid a repeat of the incident. Survey operations may also be stopped where the Spectrum representative or other authorised person considers there is a legitimate risk of an HSE incident, a breach of legislative requirements or a breach of this EP. This may require a review of the EP.

6.3 Emergency response

Emergency preparedness and response arrangements are documented within the seismic vessel Emergency Response Plan (ERP) and the Project HSE Plan. In addition, the seismic vessel will be expected to have a vessel specific SOPEP. The seismic vessel ERP and SOPEP documents will be reviewed by Spectrum to ensure they meet the requirements for both emergency and oil spill response specified within this EP (and OPEP). The SOPEP and OPEP will be tested prior to the commencement of the survey.

The Project HSE Plan contains instructions for vessel emergency, medical emergency, search and rescue, reportable incidents, incident notification and contact information to ensure that:

- All potential emergencies are identified.
- Emergency response plans are documented, accessible and clearly communicated.
- Roles and responsibilities are clearly defined.
- Adequate equipment, facilities and trained personnel are available to respond to emergency situations to mitigate adverse consequences.
- Inspection and testing of critical emergency equipment is performed.
- Emergency drills and exercises are conducted to assess emergency response capacity and capabilities.
- Lessons learned are communicated to the appropriate people.
- Adequate treatment and medical management is available for injured employees.

6.3.1 Emergency response initiation

In the event of an emergency, the Survey Vessel Master will assume overall on-site command and act as the Emergency Response Coordinator (ERC). All persons on board the vessel will be required to act under the ERC's directions. The Survey Vessel Master will maintain communications with the Vessel Manager and Project Manager and/or other emergency services in the event of an emergency.

When an emergency occurs, the initial alert will usually be made from the emergency location itself, such as from the Vessel Master or Client Site Representative, to the Crisis Management Team (CMT) or equivalent department of the vessel operator. The CMT will be mobilised upon initial contact and emergency response will be initiated. This will be carried out by working directly with the established emergency services operating in the area. The survey and support vessel(s) will have equipment on board for responding to emergencies including, but not limited to, medical equipment, fire-fighting equipment and oil spill response equipment.

Upon receiving notification of an emergency, the vessel marine crew will respond in accordance with its ERP, which details the responsibilities for each of the CMT roles. The ERC will maintain the direct link between the vessel and the CMT.

In the event of an emergency, the Survey Vessel Master will notify the onshore duty manager (and Spectrum Project Manager), who will activate the CMT. Spectrum will, if necessary, be ready to provide technical and tactical resources to the emergency response. The Spectrum Project Manager will liaise with the CMT, provide support to the response as required and provide regular reports until the response is terminated.

6.4 Oil pollution emergency plan

The development of an Oil Pollution Emergency Plan (OPEP) comprises relevant components of the seismic vessel contractor's SOPEP and the National Plan for Maritime Environmental Emergencies (NATPLAN) (AMSA 2016).

NATPLAN applies to all spills from ships in Commonwealth waters. The SOPEP recognises the divisions of responsibility to provide effective response to marine pollution incidents, as defined under NATPLAN. The SOPEP is the principal response document that will be implemented in the event of a marine oil spill, which provides specifics and provision for guiding management response to mitigate oil spills from vessels. Examples of emergency procedures that are defined in SOPEPs include steps to control:

- Collisions
- Hull damage
- Tank failure
- Vapour release
- Fire and explosions
- Bunkering spills
- Sinking.

6.4.1 First points of contact following a spill

In the event of a hydrocarbon release, the first point of contact is the AMSA Rescue Co-ordination Centre Australia (RCC Australia).

If the spill is in state waters, or likely to move into state waters, the spill must be reported to the contacts detailed in the EP. If the spill occurs outside port jurisdictions, relevant port authorities will be notified as defined in the relevant State response plan.

In the event of a spill in one of the Victorian ports to be used by the Otway Deep MSS seismic vessel, the relevant Port Authority must be notified immediately.

6.4.2 NATPLAN

NATPLAN is the framework that integrates Commonwealth and state Government(s) response, facilitating an effective response to marine pollution incidents via Australian Emergency Management Arrangements. AMSA manages NATPLAN and is the control agency in Commonwealth waters. As such, AMSA works with state Governments, emergency services and relevant industries (shipping, oil and gas, exploration and chemical industries) to maximise Australia's response capability.

NATPLAN applies to Commonwealth waters seaward of the boundary of State Waters (3 NM offshore) and integrates with state response plans. National Plan response equipment and resources are managed and controlled by AMSA's Marine Environment Protection (MEP) Division, and include:

- Australian marine oil spill centre (AMOSC)
- Maritime emergency response commander (MERCOM)
- Australian Inter-service Incident Management System (AIIMS)
- Oil spill response equipment managed via the Marine Oil Spill Equipment System (MOSES)
- Oil Spill Response Atlas (OSRA) which identified sensitive receptors (e.g. Marine and shoreline ecosystems and biological resources)
- Oil spill trajectory modelling (OSTM).

6.4.3 State waters

If a hydrocarbon release occurs in state waters (or if it is likely to move into state waters), the following relevant state oil spill contingency plans will apply:

- The Victoria State plan is the *State Maritime Emergencies (non-search and rescue) Plan* (Emergency Management Victoria 2016). The State Jurisdictional Authority (JA) and Control Agency (CA) is the Department of Economic Development, Jobs, Transport and Resources (DEDJTR).

- The South Australia State plan is the *South Australian Marine Spill Contingency Plan (SAMSCAP)* (Government of South Australia 2016). The State JA is the Department of State Development (DSD) and the CA is the Department of Planning, Transport and Infrastructure (DPTI).

- The Tasmania State plan is the *Tasmanian Marine Oil Spill Contingency Plan* (TASPLAN) (DPIPWE 2011). The State JA is the Department of Primary Industries, Parks, Water and Environment (DPIPWE), and the State CA is the Tasmanian Environment Protection Authority (EPA) Tasmanian Marine Pollution Controller (TMPC).

The deployment of state resources in Commonwealth waters will be requested and coordinated by AMSA.

6.4.4 Roles and responsibilities

AMSA is the Control Agency and hence responsible for managing response to all oil spills in Commonwealth waters under NATPLAN. Both MARPOL 73/78 and the vessel's SOPEP require the vessel master to report to the nearest State whenever there is an incident involving actual or probably discharge. The vessel SOPEP is implemented to initiate clean up resources and control discharges.

NATPLAN identifies a number of the roles that are fulfilled by State agencies as defined in the relevant State contingency plan:

- Jurisdictional Authority (JA): a statutory responsibility required to ensure that an adequate spill response plan has been prepared. In the event of a spill, the JA also ensures that a satisfactory response can be implemented by the Control Agency. In Commonwealth waters, the JA for petroleum activities is NOPSEMA, and AMSA for vessel spills.

- Control Agency (CA): is responsible for operational control and response to an oil spill in the marine environment. The CA for the Otway Deep MSS is AMSA. AMSA may request that State cas assume the lead CA role, even where the spill has occurred in Commonwealth waters (but where there is a likelihood that spill hydrocarbons may impact State resources/shorelines).

The following roles will also provide key support:

- The Seismic Survey Vessel Master will be responsible for notifications and reporting all spills to the sea to the AMSA RCC, via a POLREP form included in the vessel SOPEP. Further reports will be sent at regular intervals to inform relevant stakeholders and agencies (AMSA, NOPSEMA, Spectrum, survey contractors, etc.).

- The Spectrum Client Site Representative on board the vessel is responsible for reporting directly to Spectrum. The Spectrum Project Manager (shore-based) is then responsible for notifying NOPSEMA of any spills in Commonwealth waters.

AMSA will appoint the MERCOM, who is supported by statutory powers under the Protection of the Sea (Powers of Intervention) Act 1981. The responsibilities of the MERCOM include the management of emergency intervention issues during a response to maritime casualty incidents where there is a real (or even potential) risk of significant pollution.

6.4.5 Assessment of spill scenarios

The level of hydrocarbon release is used to identify the level of resources required to respond to the spill. This approach allows scaling of response in line with the evolving nature and scale of the incident. Incident classification (Levels 1 to 3) are defined in NATPLAN as follows:

- **Level 1** incidents are generally resolved through a First Strike response (i.e. Local or initial resources only).
- **Level 2** incidents may require deployment of jurisdictional resources supplementary to the initial response due to the more complex size/duration/resource management/risks involved.
- **Level 3** incidents may require national and international resources, and where the incident controller must delegate all management functions and focus on strategic leadership and response coordination.

The proximity of spill hydrocarbons to environmental sensitivities may also initiate an increase in incident level due to the increased risk and complexity this entails.

The following spill scenarios have been identified for the Otway Deep MSS:

- **Level 1** (<125 L): The complete loss of hydrocarbons from a transfer hose during refueling operations.
- **Level 2** (391 m^3 of Marine Diesel Oil (MDO)): The complete loss of inventory from the largest fuel tank of an example wide-tow capable survey vessel (the *M/V Polar Empress*) resulting from collision within the Operational Area. Note that should a release of this volume pose a significant risk to key sensitive receptors, then escalation to Level 3 may be triggered.
- **Level 2** (304 m^3 of MDO): The complete loss of inventory from the largest fuel tank of an example support vessel resulting from collision during deployment/retrieval of OBN units in shallow locations of the Activity EMBA. Note that should a release of this volume pose a significant risk to key sensitive receptors, then escalation to Level 3 may be triggered.

6.4.6 Environment that may be affected (EMBA)

The Environment That May Be Affected (EMBA) is the sea surface area, water column, seabed and any relevant shorelines that could be impacted by oil spilled from a petroleum activity. The EMBA for a Level 1 bunkering incident is expected to be limited to the immediate vicinity of the release point due to rapid spreading, evaporation and dilution of the spilled MDO.

The EMBA for a Level 2 spill is based on the outcomes of weathering modelling in ADIOS2. The time required for >99% reduction in spill volume was then used to determine maximum potential distance travelled by a surface slick (i.e. where ocean currents and wind drift are moving in the same direction), which is based on the following equation (after Ross 2018):

Maximum distance travelled (in km) = (W x (((3% of A) x (60a x 60b)) / 1000)) + (22 km x (W / 24 h))
where:
W = weathering time in hours from ADIOS2
A = Average wind speed (in m/s)
22 km = the maximum predicted distance travelled per day due to surface currents
60a = multiplication factor to convert to m/min
60b = multiplication factor to convert to m/hr
1000 = conversion to km/hr

In the case of the Otway Deep MSS, the extent of the EMBA beyond the operational boundary would therefore be:

Maximum distance travelled = 27 hrs x (((7 m/s x 0.03) x (60 x 60))/1000)) + (22 x (27 hrs / 24))

Maximum distance travelled = 45.162 km

= 45 km (to the nearest km)

6.4.6.1 Protection priorities within the EMBA

The NATPLAN protection priority hierarchy has been used to define protection priorities and response objectives within the EMBA:

- **PRIORITY 1**: Protection of human health and safety
  - Remove marine users from areas considered to be a safety hazard
- **PRIORITY 2**: Protection of habitat and cultural resources
- **PRIORITY 3**: Protection of rare and/or endangered fauna
  - Prevention of oil exposure to threatened fauna that are or may be present in (or in close proximity to) the Operational Area
- **PRIORITY 4**: Protection of commercial resources
  - Prevent exposure to commercial fisheries in (or in close proximity to) the Operational Area.

6.4.7 Spill response preparedness

Prior to commencement of the survey:

- The Survey Vessel Master will ensure that all relevant personnel have
  - Undergone relevant inductions
  - Are familiar with the SOPEP (and oil spill response arrangements therein)
  - Are appropriately trained to undertake their responsibilities under the SOPEP.
- The Spectrum Project Manager and Survey Vessel Master will ensure that notifications have been made to relevant stakeholders and agencies.

6.4.8 OPEP testing arrangements

The OPEP will be tested prior to commencing the Otway Deep MSS. The schedule for testing of response arrangements will include testing:

- When response arrangements are introduced
- If/when response arrangements are significantly amended
- Not later than 12 months after the most recent test
- For any new location(s) for the activity as soon as practicable after they have been added to the EP (if added after the most recent test, and before the next test is conducted).

Following testing, Spectrum will review the outcome of the test, identify any non-conformances and opportunities for improvement, and track corrective actions to completion using Spectrum's Incident Reporting Procedure. Spectrum will carry any non-conformances identified during the survey forward for consideration in future surveys as part of a continuous improvement in control measures and performance standards.

Once the seismic vessel has been confirmed, Spectrum will make arrangements for testing of the vessel's SOPEP (including response arrangements) prior to the commencement of the survey. All personnel on board the vessel will be trained and inducted in the application of the vessel's SOPEP. Regular drills and exercises will be carried out to maintain the crew's currency in response equipment use and in incident response procedures, as dictated by the SOPEP.

All drills will be documented, debriefings undertaken, and corrective actions identified (including any revisions to the SOPEP) and tracked to completion by the Survey Vessel Master.

6.4.9 Oil spill resources

Typical oil spill resources expected to be carried onboard the survey vessel are listed in the vessel's SOPEP. The vessel will carry spill containment and recovery kits with sufficient absorbent booms and materials to contain small to medium-scale deck spills. The Survey Vessel Master will be responsible for ensuring that these kits are serviced and in-date (where relevant), and appropriately stocked at all times. Minor spills will be managed through good housekeeping practices and the use of absorbent materials. Deck spills will not be discharged into the ocean. Spill clean-up materials will be retained on board the survey vessel and stored in covered containers for subsequent disposal at an appropriate onshore facility.

6.4.10 Proposed spill response strategies

Spill response strategies and tactics were considered for the credible scenarios identified (<125 L and 391 m3 MDO)(Table 6.2. In the unlikely event of a spill, the potential use of each spill response strategy/tactic would be assessed for feasibility/practicability and human health and safety, with the recommended responses subject to Net Environmental Benefit Analysis (NEBA) or Spill Impact Mitigation Assessment (SIMA) by the CA (i.e. AMSA) to demonstrate reduction of risk to ALARP prior to implementation.

Given the location of the proposed Otway Deep MSS, the preferred strategy for diesel spills will be to allow small spills to disperse and evaporate naturally, and to monitor and evaluate the position and trajectory of any surface slicks. Physical break up of surface slicks through using propeller wash from the support vessels or use of vessel fire hoses may be considered as a response measure (to aid in dispersion, dilution and evaporation of hydrocarbons). However, this tactic has potential human health and safety risks, and therefore would need to be considered carefully. The potential for further entrainment of spilled hydrocarbons will also be considered in deciding whether to enhance physical mixing. In addition, dispersants would not be used as they are unlikely to be effective on a diesel spill (CSIRO 2016), could potentially increase environmental risk, and may reduce the effectiveness of natural degradation processes. This passive response and reliance on natural processes greatly reduces the potential for impacts associated with spill response activities.

For Level 1 fuel spills in Commonwealth waters, initial actions will be undertaken by the survey vessel in accordance with the vessel SOPEP, with subsequent actions determined in consultation with AMSA (under NATPLAN). In such situations, the Survey Vessel Master (or delegate) will monitor the spill and notify AMSA of the situation status. AMSA will monitor and continue to assess this level of spill.

For Level 2 spills, the Survey Vessel Master will notify AMSA. AMSA is the responsible CA for oil spills from vessels within the Commonwealth jurisdiction and will respond in accordance with its Marine Pollution Response Plan, as approved by the AMSA Executive. Upon notification of an incident, AMSA will assume control of the incident ((AMSA 2016)). Spectrum will support the response as required. After ensuring the safety of the crew and fire prevention (and notifying AMSA), the Survey Vessel Master will implement the SOPEP and consider relevant actions (e.g. tank lightering) to reduce the oil volume released to the environment. AMSA will determine the appropriate response strategies depending upon the protection priorities at risk within the EMBA. AMSA will determine the potential need for oil spill trajectory modelling (OSTM) and possible sea/aerial surveillance to confirm/inform trajectory predictions, depending on the location, prevailing weather conditions, available vessel responses and volume released. All selected response strategies will be in accordance with NATPLAN. Recognising that there is potential for impacts associated with spill response activities, these risks would be assessed as part of any NEBA/SIMA coordinated by AMSA, to which Spectrum would contribute if requested by AMSA.

The NEBA/SIMA process requires a number of data and information inputs to allow a robust and transparent assessment. AMSA will require Spectrum to provide this information in a timely manner. Data/information requirements will comprise:

- Information from the activity-specific EP, including available modelling
- Data/information obtained immediately prior to and following the spill, such as any monitoring to support situational awareness and capability/logistical information to support spill response
- Any available baseline data.

Where hydrocarbons from the spill are likely to cross from Commonwealth to state waters, AMSA will undertake the NEBA/SIMA in conjunction with representatives from the relevant State CAs.

The Survey Vessel Master will continue to provide situation reports throughout the response activity, at the direction of AMSA. AMSA will maintain the response until relevant termination criteria are achieved.

Priority actions in the event of a large fuel spill are to make the area safe (protect human life) and to stop the leak to prevent further spillage, for example by transferring fuel to another tank.

If AMSA identify that an oiled wildlife response is required, this will be based on the Western Australia Oiled Wildlife Response Plan (DPaW/AMOSC 2014). The accumulation of hydrocarbons on shorelines is considered unlikely based on the modelling and the credible scenarios, however to allow for an adaptable response, consideration will be given to migratory shorebird feeding and roosting sites/nesting colonies and any seal colonies in and adjacent to the EMBA. In addition, species protected under Part 3 of the EPBC Act will be given particular attention, with consideration of information provided in relevant plans, guidelines and policies (e.g. NOPSEMA 2016a).

Commercial and recreational fishers and other users that operate in the area would be advised of any large spill and associated response activities via Spectrum's 24-hour 'look-ahead' correspondence. This would minimise the potential for interaction with their activities or unnecessary risks to personnel or property.

For spills in Commonwealth waters, initial actions will be undertaken by the survey vessel in accordance with its SOPEP and the survey OPEP. Under the OPEP, Type 1 operational monitoring will be carried out, which would be coordinated by AMSA and Spectrum as required. Type II scientific monitoring would be led by Spectrum if contact with sensitive receptors is expected.

Subsequent actions will be determined in consultation with the Control Agency and regulatory authorities (AMSA and NOPSEMA) under NATPLAN, with regards to the low potential for impacts posed by the spill. AMSA has indicated that it does not require titleholders to directly consult on OPEPs for seismic surveys or those addressing the operations of offshore supply vessels ((AMSA 2012)). Such operations are already covered by existing NATPLAN arrangements.

Given the low risk of adverse environmental impacts from a fuel spill in the offshore survey area, and the negligible risk of shoreline contact meaning that active response and clean-up are unlikely to be required, there is little likely environmental benefit to be gained from implementing additional controls beyond those described in Table 6.2. The risks of impacts from a fuel spill and response activities are considered to be at ALARP and acceptable.

A fuel spill requiring active clean-up response is not a credible scenario and it is highly unlikely that sensitive receptors will be impacted in the short time during which concentrations of diesel are present at potentially ecotoxic levels around the spill site. The vessel's SOPEP and the OPEP would be implemented, and the risk is considered to be low. A NEBA or SIMA would be undertaken shortly after the time of the spill to ensure environmental impacts arising from the response strategy are minimised. Full recovery of water quality and any affected biological assemblages or areas of shallow reef is expected. Spectrum therefore considers the risk of potential impacts from the spill response to be acceptable.

Table 6.2: Spill response strategies for the Otway deep MSS

Monitor and evaluate	Mechanical dispersion	Containment and recovery	Shoreline protection	Shoreline clean-up	Chemical dispersion
Relevance: relevant to all spills *Mobilisation*: Vessel observation is the most likely practicable option available for Level 1 *Efficacy*: Information gathering for spills is critical for situational awareness and supporting a co-ordinated spill response for all spills *Issues*: Visual operations of surface hydrocarbons are limited to daylight. Understanding of entrained or dissolved hydrocarbons distribution is limited to spot-point water column sampling using suitable equipment. *Summary*: This response will be implemented, with the scale of response determine by the CA appropriate to the nature and scale of the spill	*Relevance*: Can be considered for use on surface hydrocarbons *Mobilisation*: Undamaged vessel(s) in area may be used for this purpose if available (e.g. not undertaking other response operations, such as transfer of personnel or fuel from ruptured tanks, or securing damaged vessel) *Efficacy*: Limited and localised entrainment via propeller wash or through use of vessel's fire suppression hoses *Issues*: Potential human health and safety risks from e.g. VOCs. Optimal weathering will occur at the surface – entrainment increases persistence of hydrocarbons in the environment *Summary*: Not likely to reduce risk, therefore not recommended at this stage	*Relevance*: Can be considered for use on surface hydrocarbons, but not usually for an offshore spill of this nature *Mobilisation*: No surface booms/equipment will be on survey and/or support vessel (only sufficient for small- to medium-scale deck spills). Vessels would not be mobilised from port for this scenario as most hydrocarbon would have weathered and spread too thin during period to allow an effective response *Efficacy*: Unlikely to be effective on diesel hydrocarbons, due to type (MGO) and thickness of slick. Limited effectiveness in offshore environments due to limitations of use (wind/sea conditions) *Issues*: Potential human health risks from VOCs *Summary*: Unlikely to be effective or practicable. Not recommended at this stage	*Relevance*: Low risk of shoreline exposure above 10 g/m^2 Mobilisation: Unlikely *Efficacy*: Not considered effective for diesel spills that are likely to have undergone substantial weathering or for thin surface films – such as offshore spills of this nature Issues: Potential for causing localised damage to shallow subtidal sensitive habitats (e.g. seagrasses, macroalgal communities, sponge beds) from anchoring of protection booms *Summary*: Not recommended at this stage as no shorelines are predicted to be sufficiently exposed to spill hydrocarbons to be effective	*Relevance*: Low risk of shoreline exposure >10 g/m^2 Mobilisation: Unlikely Efficacy: N/A *Issues*: The impacts of shoreline clean-up are related to the method(s) used. For example, mechanical clean-up involves removal of large volumes of contaminated beach sediment, which can affect shoreline profiles/coastal processes and remove feeding habitat of shorebirds; chemical clean-up involves use of chemical dispersants and control agents to remove hydrocarbons in situ, which can then wash into adjacent (potentially sensitive) environments; cropping removes saltmarsh foliage, which can e.g. impact saltmarsh recovery and disturb/damage/destroy nesting areas *Summary*: Not recommended at this stage as shorelines are unlikely to be exposed to spill hydrocarbons at levels sufficient to pose a risk of chronic or acute impacts	*Relevance*: Can be considered for use on surface (and subsurface) releases *Mobilisation*: Vessel-based (localised) dispersant application only if dispersants/equipment are on survey and/or support vessel. Airborne dispersant application would not be mobilised for this scenario *Efficacy*: Dispersants may be considered for spills in unconfined waters where allowed by regulatory authorities. However, most of the spill will be removed by natural degradation (weathering) before a co-ordinated response could be implemented. Remaining diesel may not be amenable to dispersants (e.g. spread too thin or with a patchy surface distribution). Additionally, optimal weathering occurs at the surface, so entrainment will increase persistence of hydrocarbons *Issues*: Dispersants and other oil spill control agents (OSCA) can have a certain inherent toxicity to different organisms. Dispersed hydrocarbons can be more toxic to biota than either dispersants or hydrocarbons alone. Therefore, this response poses a potential increase in environmental risk due to potential for additional toxic impacts *Summary*: Not recommended at this stage

6.4.11 Operational and scientific monitoring plan (OSMP)

The specific operational and scientific monitoring program undertaken following an oil spill would be developed based on the following information:

- Location of the spill
- Size of the spill and likely evolution
- Types of values and assets within the EMBA
- Potential for it to have an impact upon sensitive resources
- Review of available baseline data.

Spectrum will provide immediate on-site first strike response and AMSA as the CA will direct and lead any ongoing spill response arrangements and monitoring requirements in the event of an oil spill, supported by Spectrum.

6.4.11.1 Operational monitoring

In the event of a hydrocarbon release, Spectrum would implement Operational (Type I) Monitoring in consultation with AMSA, and where appropriate, relevant State agencies. This monitoring will be implemented to:

- Determine the extent and character of a spill
- Track the movement and trajectory of surface diesel slicks
- Identify areas/ resources potentially affected by surface slicks
- Determine sea conditions/ other constraints
- Identify the efficacy and potential impacts of spill response strategies and tactics (to inform any remediation activities and any subsequent NEBA assessments).

Oil Spill Trajectory Modelling (OSTM), used in conjunction with water quality monitoring, will help determine the potential extent and direction of travel of the plume of entrained diesel, and to determine the risk of hydrocarbon toxicity impacts to sensitive receptor locations.

This monitoring will enable Spectrum to provide the necessary information to AMSA, via a POLREP form, to assist in planning appropriate response actions under NATPLAN.

Specific monitoring and data collection would include aspects of the following, as agreed with AMSA:

Immediate monitoring (approximately 0 to 6 hours):

- Estimate of sea state
- Estimates of wind direction and speed
- Characteristics of the surface diesel slicks (thickness and areal extent)
- GIS mapping
- OSTM triggered for a Level 2 spill or greater.

Modelling if triggered, will be used in conjunction with other field observation/monitoring data to identify the likely direction, spread and potential speed of the slick. This will be used as a guide to support the planning for other operational monitoring scopes. This information will allow initial identification sites for sampling, which may also provide information on the sub-surface distribution of hydrocarbons via vertical profiling of the water column (should sufficient levels of hydrocarbons remain to be detectable). Water column profiling data will be used to identify the sites and depths at which water samples will then be taken for laboratory analysis.

To be mobilised:

- Aerial surveillance for Level 2+ spills (if aircraft available offshore)
- GPS tracking using satellite drifter buoys (if available)
- Measuring concentrations of entrained hydrocarbons through the water column
- Stochastic modelling predictions for Level 2+ spills.

For potential additional consideration:

- Remote sensing (e.g. Satellite-based optical imagery and synthetic-aperture radar (SAR)) where available and practicable.

Field-based operational monitoring will be restricted to daylight hours only, when surface slicks will be visible from either vessels or via aerial surveillance. Where available and practicable, remote sensing may be used to provide situational awareness of the spatial distribution of the surface slick(s) during daylight, at night, or during overcast days.

The information gathered from this monitoring will be passed on to AMSA, via the POLREP form, but also via ongoing SITREP reports following the initial spill notification to RCC Australia.

Where GPS tracking using satellite drifter buoys, real-time spill modelling, aerial surveillance, water quality sampling and/or visual slick estimation is required, Spectrum can engage RPS under existing contractual arrangements to provide urgent specialist response services. Should there be the need to implement field response activities using external parties, a response logistics plan would be developed and initiated immediately on notification of the spill. The plan would detail logistics, equipment personnel and detailed OSMP plans.

Spectrum will implement, assist with, or contribute to (including funding if required) any other operational or scientific monitoring as directed by AMSA or outlined in this EP.

6.4.11.2 Scientific monitoring

Scientific (Type II) Monitoring would be triggered and implemented if there is a reasonable expectation that there may be adverse impacts to marine biota or habitats in the area. The key receptors for which scientific monitoring studies would be considered are:

- Benthic sediments
- Subtidal marine benthos
- Seabird populations
- Non-avian marine wildlife (cetaceans, marine reptiles and fish).

To allow for a flexible and adaptable scientific monitoring approach, additional receptors may also be considered should the nature and scale of the actual spill result in potential hydrocarbon exposure to shorelines or fisheries:

- Intertidal sediments and habitats
- Fisheries and aquaculture operations.

6.4.11.2.1 Initiation of scientific monitoring

After the Vessel Master provides notification to AMSA, Spectrum would implement scientific monitoring in the event of a Level 2 spill (or greater), in accordance with predetermined initiation criteria. A detailed OSMP Implementation Plan based on commonly used, scientifically-robust and easily-accessible methods would be developed to ensure an efficient and technically-defensible response.

The OSMP Implementation Plan would detail the equipment required for each study, travel and freight arrangements, notifications, vessel support, HSE planning, and the sampling and analysis plan. Within 12 hours of RPS being notified, a teleconference will be held between the Spectrum, AMSA, the nominated scientific personnel and the Vessel Master to finalise the requirements for implementation.

The area of potential impact to be targeted in the scientific monitoring plan would be based on observations of the slick trajectory, water quality data collected during the operational phase, and available modelling. Due to the nature of the spill, potential for spread/dispersion, constrained spatial area of the EMBA, and likely field team mobilisation period, it is considered that post-spill pre-impact baseline data collection will likely not be feasible (but will remain a consideration for planning purposes).

Scientific monitoring would focus on determining potential short and long-term environmental impacts of the spill and response actions, and subsequent recovery). Scientific monitoring may continue for some time following the termination of the operational monitoring response (NOPSEMA 2016c).

6.4.11.2.2 Scientific monitoring team

In the event of the requirement to undertake scientific monitoring, Spectrum would engage a specialist subcontractor such as RPS to rapidly finalise response plans and to deploy the required resources to undertake the monitoring activities. The core objectives, key receptors and implementation /cessation triggers have been prepared but the final scope will depend on the size, timing and location of the spill.

An adaptable scientific monitoring response must allow for the potential for operational monitoring or situational awareness obtained during a spill to indicate exposure to additional sensitive receptor types, depending on the nature and scale of the actual release. Where such an occurrence is identified, additional optional SMPs may be implemented, following agreement with AMSA

For each SMP, a detailed study template would be developed following implementation.

6.5 Reporting

6.5.1 Environmental performance reporting

The outcomes of the review of environmental performance during the survey will be summarised in the Post-survey Environmental Review Report (PERR). The outcomes of the review will be incorporated into environmental management measures applied to future activities to further improve Spectrum's environmental performance.

6.5.2 Environment incident reporting

Under Regulation 16(c) and 26 of the OPGGS(E), Spectrum is required to notify NOPSEMA of any reportable and recordable incident within a specified timeframe. Environmental incidents will be reported to the relevant government agency by the Client Site Representative.

Following any recordable or reportable incident, Spectrum will undertake an incident investigation and this information will be communicated to all relevant personnel. All recordable and reportable incidents will be documented in the PERR by the Spectrum Project Manager, and including details of the event, immediate action taken to control the situation, and corrective actions to prevent reoccurrence. The Spectrum Project Manager and Client Site Representative will follow up actions taken to ensure that the corrective actions

have been taken to close it out. When planning future activities, Spectrum will review the reportable and recordable incidents that have occurred previously to incorporate any lessons learned as part of Spectrum's continual improvement process.

6.5.3 Other reporting

6.5.3.1 Oil pollution emergency plan reporting

In the event of implementation of the OPEP, Spectrum will also provide any required reports to oil spill response agencies.

6.5.3.2 Marine fauna reporting

In accordance with the EPBC Act Policy Statement 2.1 a record of marine fauna interaction procedures employed during operations will be maintained. The MFO Report on the conduct of the survey, and any marine fauna sightings/interactions (including any whale-instigated shut-downs of the acoustic source) will be provided to DoEE within two months of the completion of the survey.

In the event of a collision with a whale, this will be reported to the DoEE national ship strike database, located at https://data.marinemammals.gov.au/report/shipstrike. This report will occur as soon as practicable, however no more than 7 days upon becoming aware of the incident.

6.5.3.3 AMSA reporting

In accordance with the Navigation Act 2012, AMSA's RCC will be immediately notified (within 1 hour), (via the national 24-hour emergency hotline) by the Survey Vessel Master in the event of:

- Any oil pollution incident in Commonwealth waters (Level 1 or 2 spill)
- Any spill greater than 10 tonnes in Commonwealth waters (Level 2 spill)
- The vessel sustaining or causing an accident, occasioning loss of life or serious injury
- The vessel receiving damage or defect which affects its seaworthiness
- Serious danger to navigation

6.5.4 Other notifications

Other notifications as required by the OPGGS(E) are described in Table 6.3.

Table 6.3: Other EP notifications

Requirements	Timing
Routine reporting	
Notify the Australian Hydrographic Service (AHS) of the survey commencement date and duration to enable a Notice to Mariners to be issued.	Email the AHS two weeks prior to the confirmed survey start date.
Notify the Australian Hydrographic Service (AHS) of the survey completion date.	Email the AHS on completion of demobilisation from the Operational Area.
Notify NOPSEMA of the start date of the survey in accordance with Reg 29 of the OPGGS(E) (submissions@nopsema.gov.au).	Email NOPSEMA at least 10 days prior to the survey starting.
Notify NOPSEMA of the end date of the survey in accordance with Reg 29 of the OPGGS(E) (submissions@nopsema.gov.au).	Email NOPSEMA within 10 days of the end of the survey.

7 STAKEHOLDER CONSULTATION

7.1 Stakeholder identification

7.1.1 Relevant persons

Relevant stakeholders were initially identified by mapping overlap between the Activity EMBA and stakeholder functions, interests or activities. A range of stakeholders with broad functions, interests or activities within the larger Oil Spill EMBA, but not known to extend to the Activity EMBA were also identified in the process. These stakeholders were classified as 'potentially interested parties' with the potential to have relevant issues and were notified of the planned activities during the first consultation round. Their feedback was assessed to determine whether they had relevant issues and if they should be considered relevant stakeholders and engaged in ongoing consultation.

Following identification, relevant stakeholders were identified under the following groups:

- Government agencies, authorities and representatives – general (11 stakeholders)
- Government agencies – fisheries (six stakeholders)
- Fisheries associations (19 stakeholders)
- Fishing companies and fishers (92 stakeholders)
- Tourism and recreation (13 stakeholders)
- Research organisations / institutions (three stakeholders)
- Industry operators (three stakeholders).

A total of 147 relevant stakeholder have been consulted for the Otway Deep MSS EP, and a summary of relevant stakeholder feedback, assessment of merit and Spectrum responses is given in the consultation report summary in Appendix A.

Potentially interested stakeholders

Stakeholders are considered 'potentially interested' if their functions, interests and activities are within the Oil Spill EMBA but do not overlap with the Activity EMBA (as stated by the stakeholder or determined by Spectrum). It also includes persons whose functions, activities and interests do not overlap with either EMBA, but who have requested to remain informed about the Otway Deep MSS.

A total of 140 potentially interested parties have been identified and are listed in Appendix A.

7.1.2 Commercial fishery consultation

Commercial fishers whose fishing areas overlapped the Activity EMBA were identified as the users with the highest likelihood of being affected by the planned activities. The Activity EMBA overlaps the jurisdictional boundaries of several Commonwealth- and State-managed fisheries, but not all fisheries are active in the EMBA.

Additional steps were taken to identify active fishing effort in the Activity EMBA given that the majority of the licence holders permitted to fish the area were considered unlikely to actually do so given the distance from ports, water depths and historic fishing effort. However, limited information could be supplied due to secrecy provisions prohibiting detailed information from being released when there are few fishers in an area.

The fisheries that may actively fish within the Activity EMBA are listed in Section 2.6.1. The fishers and fishery bodies that were identified as relevant and consulted are listed in Appendix A.

Spectrum has maintained a database of all Commonwealth fisheries / fishing stakeholders engaged during the preparation of this EP, which will be kept current through to completion of the activity in accordance with the ongoing consultation process.

7.2 Engagement tools and methods

7.2.1 General

A variety of consultation methods were selected to meet the different needs and preferences of stakeholders. Two-way communication and written forms of communication were prioritised as recommended in Information Paper (N-04750-IP1411) (NOPSEMA 2014b).

Spectrum's approach to addressing stakeholder concerns included:

- Proactively providing sufficient informative, accurate and timely information
- Honouring commitments spectrum make
- Adopting a 'no surprises' approach
- Allowing reasonable time frame for stakeholders to respond
- Reviewing all concerns, claims and objections at spectrum's weekly project team meeting
- Conducting further research on questions and objections where required, in the preparation of responses
- Responding to enquiries within a reasonable time frame
- Encouraging ongoing questions and engagement from all stakeholders.

Spectrum proactively approached a wide range of stakeholders identified as having functions, interests or activities that may be affected by the Otway Deep MSS. Stakeholders were encouraged to advise if they believed there was any impact, raise concerns, ask questions and provide feedback. The methods used to communicate with stakeholders during the preparation of this EP were emails, phone calls, text messages, face-to-face meetings, conference calls, post, formal letters, advertisements in local and regional Victorian and Tasmanian newspapers.

7.2.2 Provision of sufficient information

Spectrum provided sufficient information via a variety of communication methods including formal notification letters, phone calls, face-2-face meetings, video and conference calls, newspaper adverts, social media, and responses to specific questions/concerns/objections from relevant persons. The content of written consultation information packages is described below.

Formal notification letters with attached information sheets (stakeholder consultation letters) have been disseminated to engage with stakeholders through two rounds of consultation during preparation of the EP. The stakeholder consultation letters have been written so that they may serve as primary sources of information for stakeholders and enable them to raise questions, objections, or seek further information or consultations.

The information within the consultation letters has been tailored to the specific interests of relevant stakeholders such as oil and gas industry titleholders, sub-groups of relevant stakeholders including several within broader fishers and fisheries groups, or particular relevant stakeholders such as the VFA, SIV, TSIC and new AFMA fishers (i.e. those recently identified in the fourth round of consultation). The consultation letters have provided a detailed description of the proposed activity and described any potential impacts that may be relevant to stakeholder groups e.g. summary of impact assessment relevant to stakeholder groups e.g. fishers, and also to fishing interests e.g. lobsters and larvae impacts. The consultation letters have further provided information to the stakeholder on how the impact or risk may affect them, e.g. detailed description of the location and timing of the survey to alleviate concerns of being locked out of fishing areas, as well as the control measures that have been devised to reduce the impact to ALARP.

Formal stakeholder consultation letters have been disseminated to stakeholders. These letters were developed to serve as primary information sources for stakeholders and enable them to raise questions, objections, claims, or to request further information. Where appropriate, the content and scope of the letters was tailored to the specific interests of different stakeholder groups and were also based on information that had been requested by groups of stakeholders.

Consultation material was sent via email where email addresses were available for stakeholders and a dedicated project email address and phone number (1800 501 791) was set up to make it easier for stakeholders to respond (SpectrumOtwayDeep@rpsgroup.com.au). The response address was prominently located on all consultation material sent out to stakeholders to encourage questions and feedback.

7.2.3 Reasonable time

To ensure relevant stakeholders were allowed adequate opportunity to consider the information provided, follow-up consultation was undertaken after a minimum of two weeks, or four weeks for commercial fishers who may be unavailable for extended periods, after the initial stakeholder consultation letters were sent out For those fisher stakeholders with intermittent availability e.g. due to being at sea for fishing operations, face-2-face meetings were requested and held where possible.

Where no response was provided by relevant stakeholders, Spectrum took reasonable actions to engage with the stakeholders, including following up with additional emails and phone calls (when phone numbers could be obtained) to ensure that the information had been received, and to encourage them to respond. Those who have still not responded will be kept informed in the ongoing consultation process.

7.2.4 Fisheries liaison officer

Spectrum contracted a Fisheries Liaison Officer (FLO), to assist in consultation with fisheries licence holders that may be active within the Operational Area or OBN placement area.

The FLO targeted known operators in five different fisheries sectors, including TAS giant crab and rock lobster, VIC giant crab and the Commonwealth Southern Squid Jig Fishery. The FLO's extensive relationship with many of these fisheries meant he was able to directly engage with vessel masters at wharfs and other fishers who otherwise may not have been able to be contacted.

Consultation feedback gained by the FLO was regularly provided to Spectrum via excel spreadsheets and directly included in the stakeholder log.

7.2.5 Industry experts and fishing associations

Spectrum engaged the South East Trawl Fishing Industry Association (SETFIA) to assist consultation with fisheries licence holders who may be active within the Operational Area or OBN placement area. SETFIA had existing relationships with many fishers and well-developed understanding of the commercial fisheries likely to operate in the area. Information provided by SETFIA was provided via email (details of stakeholder requiring further consultation) and a report describing relevant Commonwealth and state fisheries.

Spectrum has further engaged SETFIA to provide notifications to all fishers that it holds contact telephone numbers for in the lead up to the planned commencement of the survey in order to allow fishers sufficient time to plan their fishing activities accordingly. A control measure and EPS that describes the frequency of the notifications and the broad content will be implemented for the activity (refer to Section 4.3.3).

As part of the ongoing consultation process, Spectrum also contracted Seafood Industry Victoria (SIV) and the Tasmanian Seafood Industry Council (TSIC) through their fee-for-service consultation to provide feedback from industry members who may not have been consulted through the FLO and SETFIA during the initial phase of consultation. The Tasmanian Seafood Industry Council disseminated the fourth round of consultation detailing the update to the survey schedule to their members via their fisheries newsletter.

7.2.6 Face-to-face meetings and video/conference calls

Relevant stakeholders were offered face-to-face meetings with Spectrum's representatives, with video/audio conference calls offered as an alternative where suitable arrangements could not be made. These served to confirm the stakeholder's functions, activities and interests in the project, discuss any issues and concerns, and provide them with an opportunity to ask questions. In particular, Spectrum proactively sought out face-to-face meetings or conference calls with relevant stakeholders who expressed concerns about the planned activities at an early stage to ensure that they had been provided sufficient information and their claims were fully understood.

7.2.7 Newspaper advertisements and social media

Advertisements were reported in the three regional Victorian and two regional Tasmanian newspapers in February 2018 as follows:

- Victorian newspapers covering the Otway coastline – one weekday advert in these three weekly newspapers on Wednesday 20 February 2019
  - Colac Herald
  - Cobden Timboon Coast – one weekday advert in this weekly newspaper (Wednesday 20 February 2019)
  - Portland Observer
- Tasmanian newspapers covering King Island and the northwest of Tasmania
  - King Island Courier – one weekday advert in this weekly newspaper (Wednesday 20 February 2019)
  - The Advocate – one weekday (Tuesday 19th February) and one weekend (Saturday 23rd February) advert.

The CEO of SETFIA, the Southern Shark Industry Alliance (SSIA), and Small Pelagic Fishery Industry Association (SPFIA) was asked to provide the 3rd formal notification to members of these associations during the fourth round of consultation. This information was provided via social media and Facebook.

7.3 Consultation during preparation of the environment plan

Stakeholder consultation for the Otway Deep MSS has been carried out over four rounds at the time of writing this EP, with ongoing consultation continuing. The consultation undertaken with relevant persons during the development of this EP is summarised in Appendix A.

7.3.1 Resolving objections and claims

Many relevant stakeholders raised similar objections and claims during consultation to date. The objections and claims that have been raised are generally the same as those raised for other seismic activities in the region. Therefore, Spectrum is confident that all of the key relevant issues have been identified and that Spectrum's response is adequate.

At this stage, Spectrum is satisfied that it has provided sufficient information, reasonable time and opportunity to allow relevant stakeholders to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities. In the context of the nature and scale of the proposed activity, the environmental sensitivities and values of the survey area, and the outcomes of the impact assessment, Spectrum is satisfied that reasonable efforts have been made and that no further attempts to contact any potentially interested parties who have not responded so far is required. Consultation with relevant stakeholders is still ongoing, and will continue following EP acceptance, during the lead up to commencement of the survey, throughout and on completion of the survey. Consultation will be ongoing for the following (second) survey season.

7.4 Ongoing consultation

Ongoing consultation with relevant persons in the lead up to the activity and during the activity is an important mechanism for continued assessment of impacts to stakeholders, which need to be reduced to ALARP and acceptable levels on an ongoing basis. This process will be ongoing for the life of the EP in the sense that new relevant persons may self-identify and are encouraged to provide comment to Spectrum at any time. Relevant persons who were consulted in the development of this EP have also been encouraged to provide ongoing comment to Spectrum for the duration of the petroleum activity.

Spectrum will initiate a review of relevant persons six months prior to commencement of each survey period to ensure that new relevant persons are identified and provided with sufficient information and time to assess potential impacts from the survey and to provide an informed response. New stakeholders will be identified by following the process employed in the preparation of the EP, i.e. through consultation with peak bodies, associations and industry representatives.

Given there is less than six months between the anticipated acceptance of this EP and the targeted survey window (Q4, 2018), the review will not be necessary in 2018, but would become necessary for survey periods in subsequent years. This review will consist of email and phone correspondence with relevant stakeholders described in Appendix A to confirm ongoing relevance and details of potential new stakeholders. In the event that an objection or claim is presented by a stakeholder either prior to or during the activity, Spectrum will assess the merit of the objection or claim and, where deemed necessary, will implement additional control measures to ensure all impacts and risks are still ALARP and acceptable.

In addition to the above process, where Spectrum becomes aware of the potential for its activities to affect stakeholder functions, interests or needs within the scope of this EP it will contact that stakeholder with sufficient information and time to address any concerns. If Spectrum becomes aware of the potential for its activities to affect a stakeholder's functions, interests or activities in a manner that has not previously been identified prior to commencing the activity, Spectrum will immediately attempt to contact and consult with the affected stakeholder. Spectrum will provide sufficient information to allow the stakeholders to make an informed decision as to how the activity may affect them and will address any concerns or claims raised during such consultation. If consultation identifies a new environmental risk not identified in the accepted Otway Deep MSS EP, or an increase in the residual risk of an already identified risk, Spectrum will identify additional control measures to ensure the risk is managed to ALARP and an acceptable level and assess the need to revise and resubmit the EP to NOPSEMA.

Recognising that fishing operations, including areas fished, target species, gear and timing, may vary between years in response to biological and human factors, all relevant fishers will also be re-engaged six months prior to the survey to confirm that the assessment of impacts on their operations in the accepted EP still holds.

In the event new information is received from stakeholders and their objections, concerns or claims indicate a new or increased environmental impact or risk, an assessment of the significance of the new or increased risk will be undertaken in accordance with Spectrum's Management of Change process. This will inform a decision on the potential resubmission of an EP revision, as is prescribed by Regulations 17(5) or 17(6) of the OPGGS(E) Regulations and described in Spectrum's Management of Change (Section 6.1.1 – Implementation Strategy).

Notifications will be provided to stakeholders prior to the survey start, during the survey and following the survey to as per their feedback during consultation, summarised in Appendix A.

7.4.1 Stakeholder communications

Spectrum will notify all relevant stakeholders, who have requested to receive no further updates and who don't have specific notification requirements, with a reminder of the survey details at least one month prior to planned survey commencement (if there is greater than four weeks from EP acceptance to commencement). The notice will provide any non-material updates to the survey details as the design of the survey is finalised, including:

- Commencement date and duration

- Survey line plan layout
- Seismic and support vessels communication details
- Reminder of contact details for further stakeholder submissions
- Information of any minor changes regarding the potential impacts and risks of the proposed activities on the functions or interests of the relevant stakeholders.

Stakeholders who were identified as potentially relevant during EP development, and who were contacted but did not respond despite several contacts, will be notified of the upcoming survey. This will give them an opportunity to reconsider the potential impacts of the seismic activity on their operations and interest.

7.4.1.1 Notifications

A notification schedule is provided in Table 7.1.

Table 7.1: Survey notifications schedule

Timing	Stakeholder / medium	Communications
Four weeks prior to survey	Noticeboards at bait and tackle shops in Portland and surrounding wharf areas	Survey information to further notify recreational and commercial fishers
Four weeks prior to survey	All relevant stakeholders	Notification of survey details to minimise potential conflicts on the water; encouraging fishers to provide up-to-date information on fishing intentions, identify potential alternative operating arrangements.
Four weeks prior to survey	Commercial fishers using the Activity EMBA	Confirm GPS locations for the deployed ocean bottom node (OBN) units
Four weeks prior to survey	Australian Hydrographic Service (AHS) datacentre@hydro.gov.au	Survey details (survey location, timing) for updates to Notice to Mariners
Fourteen days prior to survey	Director of National Parks (marinereserves@environment.gov.au)	Notification of operations within South-east marine parks in accordance with the class approval conditions set out in the South-east Commonwealth Marine Reserves Network Management Plan 2013-2023
Seven to 10 days prior to survey	Commercial fishers using the Activity EMBA	Reminder and confirmation of survey area/timing and forecast of activities prior to commencement of survey
Twenty-four to 48 hours before operations commence and when operations have been completed	AMSA's JRCC rccaus@amsa.gov.au) or phone (1800 641 792 or +61 2 6230 6811)	Survey vessel details, satellite communications details (including INMARSAT-C and satellite telephone), area of operation and requested clearance from other vessels.
Daily during survey	Commercial fishers using the Activity EMBA	Daily survey activity updates and 24-hour look-ahead communication
Two weeks following demobilisation	AHS	Notification of end of survey operations

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Appendix A

Relevant stakeholders consultation report summary

APPENDIX A: RELEVANT STAKEHOLDERS CONSULTATION REPORT SUMMARY

Relevant stakeholder feedback, assessment of merit and Spectrum response

Stakeholders are considered relevant if their functions, interests and activities overlap with the Activity EMBA (further explanation can be found in the consultation section of the EP).

Relevant stakeholders were grouped according to their common functions, interests and activities as follows:

- Government agencies, authorities and representatives – general (11 stakeholders)
- Government agencies – fisheries (6 stakeholders)
- Fisheries associations (19 stakeholders)
- Fishing companies and fishers (92 stakeholders)
- Tourism and recreation (13 stakeholders)
- Research organisations / institutions (3 stakeholders)
- Industry operators (3 stakeholders).

A summary of these stakeholders can be found in Table A.1.

A total of 147 relevant stakeholders have been consulted for the Otway Deep MSS EP. A summary of relevant stakeholder feedback, assessment of merit and Spectrum responses is given in Table A.3, including:

- Dates and methods of all consultation events with that stakeholder
- A summary of the feedback received from relevant that stakeholders for each event
- An assessment of the merits of any objections or claims raised for each event
- A statement of Spectrum's response, or proposed response, as a result of the consultation (where appropriate)
- A summary of the arrangement for ongoing consultation with that stakeholder.

Spectrum has used the NOPSEMA definition for "objections or claims" to identify and respond to them. An 'objection or claim' is taken to mean:

- To express opposition, protest, concern or complaint about the proposed activities; a request or demand that certain action be taken by the titleholder to address adverse impacts
- An assertion that there will be an adverse impact; or allegation to cast doubt about the manner in which the activities will be managed.

Note that the information in this consultation record summary has been redacted for privacy reasons.

Table A.1: Relevant stakeholders consulted for the Otway deep MSS

Stakeholder organisation or individual	Reason identified as relevant
Government agencies, authorities and representatives – general	
Australian Hydrographic Service (AHS)	*Relevant Person under Regulation 11A(a)* Commonwealth government agency responsible for the publication and distribution of nautical charts and other navigation information, including Notice to Mariners.
Australian Maritime Safety Authority	*Relevant Person under Regulation 11A(1)(a)* Commonwealth authority responsible for maritime safety, protection of the marine environment including marine pollution and maritime aviation search and rescue.
Commonwealth Department of Agriculture and Water Resources	*Relevant Person under Regulation 11A(1)(a)* Commonwealth government agency that develops policy to promote the sustainability of Australian fisheries and leads the implementation of Australia's marine pest and biosecurity management requirements.
Commonwealth Department of Defence – Directorate of Property Acquisition, Mining and Native Title	*Relevant Person under Regulation 11A(1)(a)* Commonwealth government agency responsible for the publication and distribution of nautical charts and other navigation information, including Notice to Mariners.
Director of National Parks	*Relevant Person under Regulation 11A(1)(a)* Supported by Parks Australia in managing six Commonwealth national parks, the Australian National Botanic Gardens, and Australia's network of Commonwealth marine reserves.
Mineral Resources Tasmania (MRT) – Department of State Growth	Relevant Person under Regulation 11A(1)(b)
South Australian Department of Premier and Cabinet, Resources and Energy Group – Energy Resources Division (ERD)	Relevant Person under Regulation 11A(1)(b)
South Australian Minister for Energy and Mining (previously South Australian Office of the Minister for Mineral Resources and Energy)	Relevant Person under Regulation 11A(1)(c)
Victorian Department of Economic Development, Jobs, Transport and Resources (DEDJTR)	*Relevant Person under Regulation 11A(1)(b)* Victorian government agency responsible for marine pollution, marine transport and mining and resources.
Victorian Department of Environment, Land, Water and Planning (DELWP)	*Relevant Person under Regulation 11A(1)(b)*
Victorian Office of the Minister for Resources	*Relevant Person under Regulation 11A(1)(c)*
Government agencies – fisheries	
Australian Fisheries Management Authority (AFMA)	*Relevant Person under Regulation 11A(1)(a)* Commonwealth government agency responsible for the management and sustainable use of Commonwealth fish resources.
AFMA – South East Management Advisory Committee (SEMAC)	*Relevant Person under Regulation 11A(1)(a)*
Primary Industries and Regions South Australia (PIRSA)	*Relevant Person under Regulation 11A(1)(b)*
South Australian Research and Development Institute (SARDI)	*Relevant Person under Regulation 11A(1)(b)*
Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE)	*Relevant Person under Regulation 11A(1)(b)*
Victorian Fisheries Authority	*Relevant Person under Regulation 11A(1)(b)* Victorian government authority established to manage Victoria's commercial and recreational fisheries resources.

Stakeholder organisation or individual	Reason identified as relevant
Fishing associations - relevant person under regulation 11a(1)(d)	
Commonwealth Fisheries Association (CFA)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the rights, responsibilities and interests of Commonwealth commercial fisheries.
Crustacean Fisheries Advisory Committee (CFAC)	*Relevant Person under Regulation 11A(1)(d)*
Great Australian Bight Industry Association (GABIA)	*Relevant Person under Regulation 11A(1)(d)*
Marine Fishers Association South Australia (MFASA)	*Relevant Person under Regulation 11A(1)(d)*
Port Campbell Professional Fisherman's Association (PCPFA)	*Relevant Person under Regulation 11A(1)(d)*
Seafood Industry Australia (SIA)	*Relevant Person under Regulation 11A(1)(d)*
Seafood Industry Victoria (SIV)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of the Victorian seafood industry (fishers, wholesale, processors and retail).
South Australian Rock Lobster Advisory Council Inc (SARLAC)	*Relevant Person under Regulation 11A(1)(d)*
South Australian Sardine Industry Association (SASIA)	*Relevant Person under Regulation 11A(1)(d)*
South East Trawl Fishing Industry Association (SETFIA)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of licence holders, fishers and businesses with a commercial interest in the Southern and Eastern Scalefish and Shark Fishery, specifically the Commonwealth Trawl Fishery, Shark Gillnet Hook and Trap and Scalefish Hook sectors.
Southern Shark Industry Alliance (SSIA)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of Commonwealth-licenced shark gillnet and shark hook members in the Gillnet Hook and Trap Fishery.
Southern Rocklobster Limited (SRL)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of the Australian southern rock lobster fishery. Victorian Rock Lobster Association (see below) is a member.
Small Pelagic Fishery Industry Association (SPFIA)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of licence holders, fishers and businesses with a commercial interest in the Small Pelagic Fishery
Sustainable Shark Fishing Inc. (SSFI)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of Commonwealth-licenced shark gillnet and shark hook members in the Gillnet Hook and Trap Fishery.
Tasmanian Rock Lobster Fisherman's Association (TRLFA)	*Relevant Person under Regulation 11A(1)(d)*
Tasmanian Seafood Industry Council (TSIC)	*Relevant Person under Regulation 11A(1)(d)*
Victorian Rock Lobster Association (VRLA)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of rock lobster licence holders in Victoria. Member of Southern Rock Lobster Limited (see above).
Victorian Recreational Fishermens Association (VRFish)	*Relevant Person under Regulation 11A(1)(d)* Industry body that represents the views and interests of recreational fishers in Victoria.
Warrnambool Professional Fisherman's Association (WPFA)	*Relevant Person under Regulation 11A(1)(d)*

Stakeholder organisation or individual	Reason identified as relevant
Fishing companies and fishers – relevant person under regulation 11a(1)(d)	
Fishing licence holder active within the activity EMBA	
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector *Commonwealth Southern Squid Jig Fishery *Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector *Victorian Giant Crab Fishery *Victorian Rock Lobster Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	Advises that he is currently away but is sure that the survey will impact his operations and hopes to talk later in the week. *Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery *Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery *Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	Consultant representing [redacted]
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector
[redacted]	*In process of purchasing licence for the Commonwealth Southern Squid Jig Fishery *Tasmanian Giant Crab Fishery *Tasmanian Rick Lobster Fishery
[redacted]	*Tasmanian Giant Crab Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery

Stakeholder organisation or individual	Reason identified as relevant
[redacted]	*Commonwealth South East Scalefish and Shark Fishery - Commonwealth Trawl Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector *Commonwealth Small Pelagic Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector *Commonwealth Small Pelagic Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery
Fishing licence holder potentially active within the activity EMBA (fisher has not confirmed otherwise)	
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector
[redacted]	*Victorian Giant Crab Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Victorian Rock Lobster Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Shark Hook Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector

Stakeholder organisation or individual	Reason identified as relevant
	Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Tasmanian Giant Crab Fishery *Tasmanian Rick Lobster Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Victorian Rock Lobster Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector *Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Hook Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector
[redacted]	*Victorian Rock Lobster Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Victorian Rock Lobster Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector *Commonwealth Southern Squid Jig Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery

Stakeholder organisation or individual	Reason identified as relevant
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Victorian Rock Lobster Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery *Commonwealth South East Scalefish and Shark Fishery – Commonwealth Trawl Sector
[redacted]	*Victorian Rock Lobster Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Tasmanian Rock Lobster Fishery *Tasmanian Giant Crab Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector *Victorian Rock Lobster Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector *Victorian Rock Lobster Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery - Commonwealth Trawl Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth Southern Squid Jig Fishery Identified in the SETFIA report (SETFIA 2018)

Stakeholder organisation or individual	Reason identified as relevant
[redacted]	*Commonwealth South East Scalefish and Shark Fishery - Commonwealth Trawl Sector *Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector *South Australian Rock Lobster Fishery
[redacted]	*Tasmanian Giant Crab Fishery Identified in the SETFIA report (SETFIA 2018)
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Hook Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery
[redacted]	*Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Shark Gillnet Sector
[redacted]	*Commonwealth Southern Squid Jig Fishery
Tourism and recreation – relevant person under regulation 11a(1)(e)	
[redacted] Fishing and Adventure Tour	*Relevant Person under Regulation 11A(1)(e)* Recreational fishing potentially active in the Activity EMBA
Australian Anglers Association (Victorian Division) Inc	
[redacted] Marine Charters	
Game Fishing Association of Victoria	
[redacted] Fishing Carters	
[redacted] Fishing Carters	
[redacted] Sportfishing Club	
[redacted] Fishing Craters	
[redacted] Angling Club	
[redacted] Charters	
[redacted] Fishing	
[redacted] Charters	
[redacted] Charters	
Research and conservation relevant person under regulation 11a(1)(d)	
Blue Whale Study	Research interests/activities within or near the Activity EMBA
Deakin University	
Institute of Marine and Antarctic Science (IMAS)	
Industry operators relevant person under regulation 11a(1)(d)	
3D Oil	Petroleum titleholder with an active offshore Exploration Permit that overlaps with the survey area.
Beach Energy	
Cooper Energy	

Potentially interested stakeholders

Stakeholders are considered ‘potentially interested’ if their functions, interests and activities are within the Oil Spill EMBA but do not overlap with the Activity EMBA (as stated by the stakeholder or determined by Spectrum). It also includes persons whose functions, activities and interests do not overlap with either EMBA, but who have requested to remain informed about the Otway Deep MSS.

A total of 140 potentially interested parties have been identified and are listed in Table A.2.

Table A.2: Potentially Interested Parties engaged by Spectrum for the Otway Deep MSS EP

Stakeholder organisation or individual	Key contact person(s)
Government agencies	
Colac Otway Shire Council, Victoria	Office
Corangamite Shire Council, Victoria	Office
District Council of Grant, South Australia	Office
Glenelg Shire Council, Victoria	Office
Marine Safety Tasmania (MAST)	Office
Moyne Shire Council	Office
Parks Victoria	Office
Parks Victoria – Apollo Bay	[redacted]
Parks Victoria – Port Campbell	[redacted]
Parks Victoria, National Parks Advisory Council (NPAC)	[redacted]
South Australian Department of Environment and Water – Marine Parks	Marine Parks – Office Strategy and Advice – [redacted] Oil Wildlife Response – [redacted]
South Australian Department of Planning, Transport and Infrastructure (DPTI)	[redacted]
South Australian Environment Protection Authority (SA EPA)	[redacted]
South Australian Federal MP for Barker	[redacted]
South Australian State MP for Mt Gambier	[redacted]
Tasmanian Department of Premier and Cabinet	Office
Tasmanian Office of the Premier of Tasmania	[redacted]
Transport Safety Victoria	Office
Victorian Department of Environment, Land, Water and Planning (DELWP) – Heritage Victoria	[redacted]
Victorian Department of Transport, Planning and Local Infrastructure (DTPLI) – Marine Pollution	Office
Victorian Office of the Minister for Energy, Environment and Climate Change	[redacted]
Victorian Office of the Premier of Victoria	[redacted]
Warrnambool City Council, Victoria	Office
Fishing industry associations	
Abalone Industry Association of South Australia	[redacted]
Australian Southern Bluefin Tuna Industry Association	[redacted]
Central Zone Abalone Fishery	[redacted]
Northern Zone Rock Lobster Fisherman's Association (NZRLFA)	[redacted]
RecFish SA	[redacted]
Southern Zone Abalone Management Inc	[redacted]
Sustainable Shark Fishing Inc (SSFI)	[redacted]
Victorian Abalone Divers Association (VADA)	[redacted]
Victorian Scallop Fisherman's Association (VSFA)	[redacted]
Western Abalone Divers Association (WADA)	[redacted]

Stakeholder organisation or individual	Key contact person(s)
Wildcatch Fisheries of South Australia (WFSA)	[redacted]
Tourism and recreation	
Bagout Fishing Charters	No name available or confirmed.
Great Ocean Road Regional Tourism	[redacted]
Hit n Run Fishing Charters	[redacted]
King Island Tourism	Office
Nelson Visitor Information Centre	Office
Ocean Racing Club of Victoria	[redacted]
Port Campbell Boat Charters	[redacted]
Port Campbell Boating Club	[redacted]
Port Campbell Tourism Information Centre	Office
Port Fairy Angling Club	[redacted]
Port Fairy Boat Charters	No name available or confirmed.
Port Fairy Visitors Information Centre	Office
Portland Professional Fisherman's Association (PPFA)	[redacted]
Portland Visitor information centre	Office
Port MacDonnell Community Complex and Visitor Information Outlet	Office
Red Hot Fishing Charters	[redacted]
Southerly Fishing Charters	[redacted]
Surveyed Charter Boat Owners Association of South Australia	[redacted]
Tourism Victoria	Office
Twelve Apostles Tourism and Business Association	Office
Victorian National Parks Association	Office
Warrnambool Visitor Information Centre	Office [redacted]
Research and conservation	
Australian Conservation Foundation	Office
Conservation Council South Australia	[redacted]
Eastern Maar Aboriginal Corporation	[redacted]
Flinders University – Cetacean Ecology, behaviour and Evolution Lab	[redacted]
Geoscience Australia	Office
International Fund for Animal Welfare (IFAW)	Office
The Wilderness Society	Office
Whale and Dolphin Conservation Society	Office
Fishing companies and fisheries	
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.

Stakeholder organisation or individual	Key contact person(s)
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth Small Pelagic Fishery
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth Southern and Eastern Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	* Commonwealth South East Scalefish and Shark Fishery
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Victorian Rock Lobster Fishery. (identified in the SETFIA report (SETFIA 2018)).
[redacted]	Fisherman in the Commonwealth Southern Squid Jig Fishery.
[redacted]	Fisherman in the Commonwealth Small Pelagic Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Victorian Rock Lobster Fishery. (identified in the SETFIA report (SETFIA 2018)).
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery – SFR holder. (identified in the SETFIA report (SETFIA 2018)).

Stakeholder organisation or individual	Key contact person(s)
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery – Gillnet Hook and Trap Subsector – Scalefish Hook Sector. (identified in the SETFIA report (SETFIA 2018)).
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery. Identified in the SETFIA report (SETFIA 2018).
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery. (identified in the SETFIA report (SETFIA 2018)).
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.

Stakeholder organisation or individual	Key contact person(s)
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	No name available or confirmed. Fisherman in the Commonwealth South East Scalefish and Shark Fishery
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth Southern and Eastern Scalefish and Shark Fishery. (identified in the SETFIA report (SETFIA 2018)).
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Their vessel is not operating
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	*Commonwealth South East Scalefish and Shark Fishery - Commonwealth Trawl Sector Identified in the SETFIA report (SETFIA 2018)
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.
[redacted]	Fisherman in the Commonwealth South East Scalefish and Shark Fishery.

Table A.3: Summary of relevant stakeholder feedback, assessment of merit and Spectrum responses

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
Government agencies – general					
Australian Hydrographic Service (AHS) [redacted]	09/02/18 12/02/18 13/03/18 20/03/18	1st formal notification 1A General Email incoming Email incoming Email outgoing	Via email 12/02/18: Autogenerated response was provided by the AHS acknowledging the email containing the first stakeholder consultation letter (sent on 09/02/18) had been received. Via email 13/03/18 The AHS requested to be kept updated on the project and notified at least three weeks prior to commencement of any activities to allow for the publication of Notices to Mariners.	Stakeholder has made a request to be kept informed and for notification prior to activity commencement. AHS's request to be kept informed regarding the survey and for notification prior to activity commencement is merited. Spectrum will keep the AHS informed and ensure the EP includes notification requirements prior to activity commencement.	Via email 20/03/18: Spectrum replied confirming the AHS would be kept updated and they would notify datacentre@hydro.gov.au of the survey details (survey location, timing) at least 3 weeks prior to mobilisation and following demobilisation for issue of Notice to Mariners. A control measure was included in the EP to notify the AHS four weeks prior to survey mobilisation and within two weeks of survey demobilisation. The AHS is a relevant stakeholder and will therefore continue to receive project updates from Spectrum.
	01/06/18 04/06/18	2nd formal notification 2B Government Agencies Email incoming	Via email 04/06/18: Autogenerated response was provided by the AHS acknowledging the email containing the second stakeholder consultation letter (sent on 01/06/18) had been received. No further feedback has been received from the AHS regarding the letter.	No new objections or claims by the AHS Ongoing consultation will continue.	The AHS is a relevant stakeholder and will continue to receive project updates from Spectrum, as well as the notifications described in the row above.
	01/02/19 08/03/19	3rd formal notification 3A General Email incoming	No further feedback has been received from the AHS regarding the 3rd formal notification sent to the AHS on 1st Feb.	No new objections or claims by the AHS Ongoing consultation will continue	Via email incoming 08/03/19: Automated response acknowledging 3A notification. The AHS is a relevant stakeholder and will continue to receive project updates from Spectrum, as well as the notifications described in the rows above.
		Ongoing consultation: Spectrum will continue to provide project updates to the AHS and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP. Spectrum will notify the AHS 4 weeks prior to survey mobilisation.			
Australian Maritime Safety Authority (AMSA) [redacted]	09/02/18 12/02/18 12/02/18	1st formal notification 1A General Email incoming Email incoming	Via two emails on 12/02/18: In response to the first stakeholder consultation letter (sent on 09/02/18), AMSA thanked Spectrum for the information and requested a shape file of the survey area. The two emails sent were approximately an hour apart but contained the same request.	Stakeholder made a request for further information. AMSA's request for the shape file is merited due to role as regulatory body for maritime safety. Spectrum provided shape file to AMSA.	Refer to the response in the row below.
	15/02/18 20/02/18	Email incoming Email outgoing	Via email 15/02/18: The AMSA provided a historical AIS traffic plot of the planned survey region and noted that the northern section of the planned survey area is one of Australia's busiest shipping routes. They advised that the MV Polar Marquis can expect to encounter a mixture of small commercial vessels and large vessels anywhere within the proposed survey area. They noted that Spectrum intend to utilise a support vessel to manage interactions with other vessels. They requested the following: MV Polar Marquis notify the Joint Rescue Coordination Centre (JRCC) through rccaus@amsa.gov.au (Phone: 1800 641 792 or +61 2 6230 6811) for the promulgation of navigation warnings 24-48 hours before operations commence that the JRCC will require the MV Polar Marquis' details (including callsign and Maritime Mobile Service Identity (MMSI)), satellite communications details (including INMARSAT-C and satellite telephone) and area of operation that the JRCC need to be advised when operations start and end that the AHS must be contacted through datacentre@hydro.gov.au no less than four working weeks before operations commence for the promulgation of related Notices to Mariners.	AMSA provided feedback that part of the survey area overlaps with one of Australia's busiest shipping routes and the types of vessels that would be encountered. AMSA's requests are merited due to role as regulatory body for maritime safety. Action: Spectrum to ensure the potential impacts and risks associated with vessel interactions have been assessed in the EP and control measures have been adopted to manage interactions. Spectrum have ensured the EP includes notification requirements prior to activity commencement.	Via email 20/02/18: Spectrum replied to the AMSA thanking them for their feedback. Spectrum noted they had managed to determine the spatial coverage of the survey area anyway (without the shape files) and confirmed that the advice about the significance of the shipping routes and the requested notifications to the JRCC and the AHS would be incorporated into the EP. Spectrum has since ensured that the potential impacts and risks associated with vessel interactions have been assessed in the EP and control measures have been adopted to manage interactions. The notification requests that the AMSA made have also been included in the EP as individual control measures. These control measures were included in the second stakeholder consultation letter sent to the AMSA on the 01/06/18 (refer to the row below).
	01/06/18 01/02/19	2nd formal notification 2B Government agencies 3rd formal notification 3A General	No further feedback has been received from the AMSA regarding the letters sent on 01/06/18 and 01/02/19.	No additional feedback from AMSA. Ongoing consultation will continue	The AMSA is a relevant stakeholder and will continue to receive project updates from Spectrum, as well as the JRCC notifications described in the row above.
		Ongoing consultation: Spectrum will continue to provide project updates to the AMSA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
Commonwealth Department of Agriculture and Water Resources – Petroleum & Fisheries	09/02/18 01/06/18 01/02/19	1st formal notification 1A General 2nd formal notification 2B Government Agencies 3rd formal notification 3A General	No feedback or response has been received in response to the 1st, 2nd and 3rd formal notifications sent to DAWR Petroleum and Fisheries Department on 9th February 2018, 1st June 2018 and 1st February 2019.	No feedback provided. Reasonable opportunity has been given for response. Ongoing consultation will continue.	The DAWR – Petroleum & Fisheries is a relevant stakeholder and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to the DAWR and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Commonwealth Department of Agriculture and Water Resources – Biosecurity and Ports	09/02/18 09/02/18 01/06/18 01/02/19 01/02/19	1st formal notification 1A General Email incoming 2nd formal notification 2B Government Agencies 3rd formal notification 3A General Email Incoming	Via email 09/02/18: Autogenerated response was provided by the DAWR – Ports acknowledging the email containing the first stakeholder consultation letter (sent on 09/02/18) had been received. Via email 01/02/19: Autogenerated response was provided by the DAWR – Ports acknowledging the email containing the third stakeholder consultation letter (sent on 01/02/19) had been received.	No feedback provided other than acknowledgement of receipt. Reasonable opportunity has been given for response. No action required.	The DAWR – Biosecurity and Ports is a relevant stakeholder and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to the DAWR and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Commonwealth Department of Defence (DoD) [redacted]	09/02/18 01/03/18 12/03/18	1st formal notification 1A General Email incoming Email outgoing	Via email 01/03/18: In response to the first stakeholder consultation letter sent on 09/02/18, the DoD advised that they have no objections to the planned activities. They requested that Spectrum notify the AHS at least four weeks prior to beginning operations.	Stakeholder requested that the AHS be notified at least four weeks prior to start of operations. DoD's request for the AHS to be notified four weeks prior to start of operation is merited due to AHS role of publishing Notice to Mariners and DoD role of national security. Action: Spectrum included in the EP notification requirements prior to activity commencement.	Via email 12/03/18: Spectrum replied confirming the AHS would be notified prior to survey mobilisation. Spectrum has since ensured a control measure was included in the EP to notify the AHS four weeks prior to survey mobilisation and within two weeks of survey demobilisation. This control measure was included in the second stakeholder consultation letter sent to the DoD on the 01/06/18 (refer to the row below) and on the 28/03/19.
	01/06/18 04/06/18 14/06/18 13/07/18	2nd formal notification 2B Government Agencies Email incoming Email outgoing Email outgoing	Via email 04/06/18: In response to the second stakeholder consultation letter sent on 01/06/18, the DoD acknowledged receipt of the letter and requested further information regarding the acoustic passive receive capability of the OBN's, how the data is retrieved and who has access to the data (raw and analysed).	The DoD requested further information on the activity, specifically the OBNs. The DoD's request for additional information regarding the OBN's is merited due to DoD role in national security. Action: Spectrum to provide requested information to the DoD.	Via emails on 14/06/18 and 13/07/18 (the same response was accidentally sent twice due to transition of Project Team personnel): Spectrum replied to the DoD request stating the following: the OBNs record sub-seafloor acoustic reflections and refractions for geological purposes and to monitor seismic survey noise for environmental protection purposes. they have never been used to measure shipping traffic and is not an effective tool for monitoring naval activities; such extraneous noise are unwanted artefacts and if they are present then they will typically be filtered or processed out. the nodes are broadband and have a flat frequency response: 3-component geophone: 0.0167 Hz-100 Hz Hydrophone: 2 Hz-30 KHz. the data can only be retrieved after the recovery of the OBNs from the seafloor, which will be between several weeks to a few months after deployment. Spectrum Geo and Australian National Seismic Imaging Resource (ANSIR) are the primary users of this data but there may be additional parties in future. No further feedback or comment has been received from the DoD in response to this information.
	01/02/19	3rd formal notification 3A General	No response has been received in response to the 3rd formal notification sent to the DoD on 1st February 2019.	No feedback provided. Reasonable opportunity has been given for response. No action required.	
	28/03/19	Email outgoing			Via email outgoing 28/03/19: Spectrum followed up on consultation from 12/03/18 in which the stakeholder requested a minimum notification period of 3 weeks prior to survey commencement. Spectrum provided the stakeholder with the control measure included in the Environment Plan for the AHS to be notified 4 weeks prior to survey commencement. The Department of Defence is a relevant stakeholder and will continue to receive project updates from Spectrum.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Ongoing consultation: Spectrum will continue to provide project updates to the DoD and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP. Spectrum will notify the DoD 4 weeks prior to survey mobilisation.			
Commonwealth Director of National Parks (DNP) [redacted]	09/02/18 06/03/18 09/04/18	1st formal notification 1A General Email incoming Email outgoing	Via email 06/03/18: In response to the first stakeholder consultation letter sent on 09/02/18, the DNP noted that the operational and acquisition areas overlap: the multiple use zone (IUCN VI) of the Zeehan Marine Park the special purpose zone (IUCN VI) of the Zeehan Marine Park the special purpose zone (IUCN VI) of the Nelson Marine Park. They advised that marine parks are managed primarily for ecologically sustainable use of natural ecosystems while protecting and preserving biological diversity and natural values of the park in the long term. They provided links to descriptions of the conservation values of the Zeehan and Nelson Marine Parks and recommended that Spectrum give consideration to the potential impacts and risks of the proposed activity on the conservation values of the Marine Parks in the EP and explain how they will reduce impacts to ALARP. They advised that mining operations can occur in Special Purpose and Multiple Use zones (IUCN VI) within the South-east network of Marine Parks, by either class approval or permit. They provided links to the class approvals developed under the South-east Commonwealth Marine Reserves Network Management Plan 2013-2023 which authorise certain mining operations to be undertaken i.e. Class Approval for Mining and Class Approval for Mining (Not Controlled Action). They noted that while class approvals must be followed they do not replace the need for titleholders to have an accepted EP. They also requested to be informed upon the final approval of the EP.	The DNP's requested for additional information regarding final approval of the EP is merited due to the operational and acquisition area of the survey overlapping the Zeehan Marine Park. DNP's recommendations that Spectrum consider potential impacts and risks of the proposed activity on the marine parks has merit. Action: Spectrum to review notification requests and if adopted include in the EP..	Via email 09/04/18: Spectrum replied to the DNP and confirmed that impacts on the conservation values of the Zeehan and Nelson Marine Parks have been considered in the EP and that the impacts will be managed to ensure they are reduced to ALARP. Spectrum subsequently ensured this is demonstrated in the EP. Spectrum confirmed that operations within special purpose and multiple use zones will only be undertaken in accordance with the approved EP and will follow the class approval conditions set out in the South-east Commonwealth Marine Reserves Network Management Plan 2013-2023. In accordance with the class approval conditions set out in the South-east Commonwealth Marine Reserves Network Management Plan 2013-2023, Spectrum confirmed the DNP will be notified upon the final approval of the EP and 14 days prior to beginning any operations within South-east marine parks. Spectrum has included these notification requirements in the EP.
	01/06/18	2nd formal notification 2A General	No response has been received in response to the 2nd formal notification sent to the DNP on 1st June 2018.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	01/02/19	3rd formal notification 3A General	No response has been received in response to the 3rd formal notification sent to the DNP on 1st February 2019.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	14/03/19	Email outgoing	No response has been received in response to the email outgoing sent to the DNP on 14/03/19	No feedback provided, reasonable opportunity will be given for a response. Response will be addressed in ongoing consultation.	Via email outgoing 14/03/19: In response to the DNP suggestion that Spectrum give consideration to the potential impacts and risks of the proposed activity on the conservation values of the marine parks in the EP and how Spectrum will reduce impacts to ALARP sent on 06/03/19, Spectrum provided the DNP with a summary as to how the risks to the South East Commonwealth Marine Reserves (particularly Zeehan and Nelson Marine Parks) have been reduced to as low as reasonably practicable with respect to sound impacts to migrating whales. Minimising sound exposure risks – South East Commonwealth Marine Reserves Values – Whales Impacts to marine fauna from anthropogenic noise (Seismic) are relatively well understood for some marine fauna group (e.g. marine mammals), with the exception of marine mammals during sensitive behavioural processes (e.g. calving). The EP assessment considers the environmental impact to the location specific environmental values and sensitivities of the Activity EMBA (e.g. likely encounter with foraging pygmy blue whales). a precautionary approach has been applied to augment decision making further where uncertainty continues to exist. Spectrum has applied a precautionary approach in managing potential impacts with pygmy blue whale (PBW) aggregations with the application of additional control measures for reducing potential impacts form underwater sound from seismic operations. These controls include measures for relocation of the vessel in the event >15 whales are present int eh observation zone during pre-start observation check, precautionary

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					shut-down procedures, adaptive management including Passive Acoustic Monitoring and monitoring of upwelling events. Passive Acoustic Monitoring System (PAM) Spectrum will utilise PAM as a control to mitigate impacts to pygmy blue whales that might be present in the operational area during operations. PAM operators will work closely with the visual observation team (marine fauna observers, MFOs) to identify and locate vocalising marine mammals to determine if they are within the shutdown or low-power zones. PAMGuard software will also be used to provide increased confidence in detections, classifications and localisation of marine mammal vocalisations in real time. The combination of PAM (and PAMGuard) with visual observations will provide an effective control of operations and ensure that the survey meets the requirements of the EP in ensuring appropriate mitigation actions are undertaken when marine mammals are detected within the specified mitigation zones Thermal Imaging Camera System Spectrum is proposing a combination of two or more methods to improve detection probability for real-time monitoring, and to help ensure an “in-time detection” of cetaceans during periods of low visibility/ night. A dual camera thermal imaging system will be implemented on the chase vessel to observe cetaceans during periods of low visibility and at night time. In optimal conditions, medium sized whales will be detectable reasonably well in up to 1.5km, and larger whales with reliable detection rages at 2km. Reliable detection of small whales and dolphins should be possible up to 500m and pinnipeds at <500m. The selected system consists of a dual visual/infrared system with HD and thermal imaging cameras, enabling both day and night monitoring up to 360º coverage. Distance estimation software incorporated into the system to provide objective and recordable distance estimation on the sea surface and an overlay of the EPBC Policy statement 2.1 precautionary zones. Monitoring of the Upwelling The survey environmental advisor (SEA) will monitor MODIS sea surface temperature (SST_ ad chlorophyll-a (Chl-a) heat maps on a daily basis throughout the survey to detect periods of upwelling (low SST and high Chl-a) close to the coast. This monitoring information will be used to inform Spectrum’s understanding of the region and when the upwelling season starts, and the link between SST/Chl-a, upwelling events and the possible presence of pygmy blue whales. The information will inform management measures for the following season’s survey and interrogated to determine if there are any lags between upwelling events and whales seen/detected. The DNP is a relevant stakeholder and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to the DNP and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP. Spectrum will notify the DNP 14 days prior to survey mobilisation.			
Mineral Resources Tasmania (MRT) – Department of State Growth	09/02/18 11/06/18 01/02/19	1st formal notification 1A General 2nd formal notification 2B Government Agencies 3rd formal notification 3A General	No response has been received in response to the 1st, 2nd and 3rd formal notifications sent to the MRT on 9th February 2018, 11th June 2018 and 1st February 2019.	No feedback provided. Reasonable opportunity has been given for response.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	07/03/19 07/03/19	Phone call outgoing Email outgoing	Via phone call 07/03/19: MRT stated that they have been receiving the updates distributed to them from Spectrum and had no concerns at this stage regarding the project. Requested to be kept informed and to receive future updates.	Requested to be kept up to date with project updates.	Via phone call and email 07/03/19: Spectrum informed MRT that they would continue to send updates regarding the proposed survey to the email address provided. Spectrum followed up the phone call with an email documenting the phone call, stating that the MRT will continue to receive updates regarding the Spectrum Otway Deep MSS.
		Ongoing consultation: Spectrum will continue to provide project updates to the MRT and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
South Australian Department of Premier and Cabinet, Resources and Energy Group - Energy Resources Division (ERD) [redacted]	27/02/18 27/02/18 16/03/18 16/03/18	1st formal notification 1A General Email incoming Email incoming Email outgoing	Via email incoming 27/02/18: Automatic reply from ERD representative stating that they are currently out of office and will respond once back in the office. Via email on 16/03/18: In response to the first stakeholder consultation letter the ERD noted that the boundary coordinates for the operational area were provided but not for the survey area and requested these. Flagged the replenishment and refuelling of the survey vessel by the support vessel while at sea and that helicopters may be used to facilitate crew changes with the SA DPTI and SA EPA. Requested that they provide comment (if required) given that these activities fall under their areas of expertise. Provided information on the respective roles of South Australian Government agencies in relation to offshore oil spill response and planning including key agencies, their respective roles and key contacts at each agency for consultation. Suggested that Spectrum consider additional stakeholders including: South Australia EPA Cetacean Ecology, Behaviour and Evolution Lab (Flinders University) Australian Conservation Foundation Conservation Council of SA Whale and Dolphin Conservation Society Commonwealth Scientific and Industrial Research Organisation (CSIRO) Geoscience Australia State and Federal MP's with constituencies in the immediate vicinity. The ERD requested that they continue to be kept informed.	The ERD requested (and suggested) the following: boundary coordinates for the survey area suggested consulting with the DPTI and the EPA regarding support activities associated with the survey suggested Spectrum consider consulting with several other stakeholder organisations (listed) requested they be kept informed on the activity. Action: Spectrum to review and respond to the ERD's suggestions and requests.	Via email on 16/03/18: Spectrum provided the ERD with boundary coordinates for the survey area (i.e. the 23,620 km^2 area outlined in red in the first stakeholder consultation letter) but reiterated that seismic data would only be acquired over a maximum area of 9,000 km^2 (per season) within the larger survey area boundary and that the area of acquisition in 2018 was yet to be decided. Spectrum also followed up with the consultation suggestions (covered in the rows below). This stakeholder is considered relevant and has received subsequent communications and they will continue to receive project updates from Spectrum.
	19/03/18 20/03/18	Email incoming Email outgoing	Via email on 19/03/18: The ERD provided contact details for SA DPTI and SA EPA.	The ERD provided information to Spectrum for the purposes of consultation. The suggestions made by the ERD are merited. Action: Spectrum to ensure the appropriate contacts at the DPTI and EPA are consulted with.	Via email on 20/03/18: Spectrum confirmed the first stakeholder consultation letter had been forwarded to the EPA contact ERD provided, and that the DPTI contact had already received it.
	01/06/18 04/06/18 05/06/18 07/06/18 07/06/18 08/06/18 08/06/18	2nd formal notification 2A General Email incoming Email outgoing Email incoming Email outgoing Email incoming Email outgoing	Via email on 04/06/18: The ERD indicated a possible typographic error in the Co-ordinate Reference System that was referred to in the second stakeholder consultation letter. Via email on 07/06/18: The ERD noted the stakeholder list provided in the second stakeholder consultation letter did not include the list of organisations the ERD had previously recommended consulting with (noting that they may not have been considered "relevant persons"). Via email on 08/06/18: The ERD stated they were chasing down the contacts requested.	The ERD provided feedback in response to the second stakeholder consultation letter, as follows: picked up a potential typographic error indicated concern that stakeholders they recommended contacting were not in the list of stakeholders in the second stakeholder consultation letter. The ERD's feedback regarding the typographic errors and concerns regarding additional stakeholders are merited. Action: Spectrum to review and respond to these issues/concerns and ensure errors and any outstanding consultation with relevant stakeholders is conducted.	Via email 05/06/18: Spectrum confirmed the error identified was typographic and apologised for the mistake. Stated that only WGS coordinates were included in the table, which is otherwise correct, and that UTM coordinates were not included for either zone. Via email 07/06/18: Spectrum provided the ERD with a full list of all stakeholders consulted as either relevant persons or as potentially interested parties, which included all the organisations provided by the ERD via email on 16/03/18. Spectrum noted some had only recently been added and notified and asked the ERD if they had alternative contact details (names, etc.) for some of them. Via email on 18/06/18: Spectrum thanked ERD for their assistance.
	11/06/18 18/06/18 13/07/18	2nd formal notification 2A General Email incoming Email outgoing	Via email on 18/06/18: Following distribution of the second stakeholder consultation letter, the ERD replied that their Environment Team did not have specific contacts for the agencies Spectrum listed but provided two suggestions for alternative agency contacts at Geoscience Australia.	No objections or claims, the ERD provided information to Spectrum for the purposes of consultation. Action: Spectrum to review the contacts provided.	Via email on 13/07/18: Spectrum apologised for the delay and thanked ERD for the contact details. Spectrum reviewed contacts provided and determined the existing contacts were suitable for ongoing consultation. The ERD is considered a relevant stakeholder and will continue to be kept informed on the activity.
	01/02/19	3rd formal notification 3A General	No response has been received in response to the 3rd formal notification sent to the ERD on 1st February 2019.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	14/03/19	Email outgoing	No response has been received from the ERD in response to the email outgoing sent on 14th March 2019.	No feedback provided, reasonable opportunity will be given for a response. Response will be addressed in ongoing consultation. Action: Respond to ERD's feedback (once received) to the email sent 14/03/19 in ongoing consultation.	Via email outgoing 14/03/19: In response to the ERD suggestion that Spectrum provide comment if activities such as the replenishment and refuelling of the survey vessel by the support vessel while at sea and whether helicopters will be used for crew changes while at sea as these activities will fall under the SA DPTI and SA EPA regulations, communicated to Spectrum via email on 16th March 2018. Spectrum responded to the request for comment by the department in a letter dated 14th March 2019. Spectrum informed the department that all refuelling and crew changes will occur in commonwealth waters, however, should Spectrum require additional information or services form SA DPTI and/or SA EPA contact will be made directly to the two departments. Spectrum also informed ERD that the Oil Pollution Emergency Plan had been updated to take into account DPTI's Offshore Petroleum Industry Guidance Note with respect to spills in SA state waters and the roles of the response agencies. The ERD is a relevant stakeholder and will continue to be informed regarding the progress of proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to the ERD and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
South Australian Office of the Minister for Energy and Mining Key contact: Hon Dan van [redacted]	27/02/18 28/02/18 01/06/18 01/06/18 05/06/18 05/06/18 05/06/18 24/08/18	1st formal notification 1A General Email incoming 2nd formal notification 2B Government Agencies Email incoming Email outgoing 2nd formal notification 2B Government Agencies Email incoming Letter incoming	Via email 28/02/18: In response to the first stakeholder consultation letter, email acknowledging that the information had been received and would be brought to the attention of the Minister. Via email 01/06/18: In response to the second stakeholder consultation letter, Spectrum received an email stating the account was no longer in use due to the State election. Alternative contact details were provided. Via letter 24/08/18: Letter from [redacted]. He stated he understood Spectrum were in contact with the ERD which was appropriate and that he had no feedback or concerns in response to the proposal.	No objections or claims. Reasonable opportunity has been given for response and feedback.	Via email 05/06/18: In response to email on 01/06/18, Spectrum acknowledged the new details and forwarded a copy of the second stakeholder consultation letter to [redacted]. Received an autogenerated email acknowledging it had been received. This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	01/02/19 01/02/19	3rd formal notification 3A General Email incoming	Email incoming 01/02/19: Automatic response incoming from the Minister for Energy and Mining, stating that the automatic response is to advise the information sent has been noted.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to the South Australian Office of the Minister for Energy and Mining and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Victorian Department of Economic Development, Jobs, Transport and Resources (DEDJTR)	09/02/18 01/06/18	1st formal notification 1A General 2nd formal notification 2B Government Agencies	No feedback or response received to the 1st and 2nd formal notifications sent to DEDJTR on 9th February and 1st June 2018.	No feedback provided. Reasonable opportunity has been given for response.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	01/02/19 01/02/19 08/03/19	3rd formal notification 3A General Email incoming 3rd formal notification 3A General	Via email incoming 01/02/19: Austomatic response incoming from DEDJTR stating that the employee receiving the updates is [redacted] and providedcontact details for [redacted], the employee replacing the previous staff member [redacted].	No feedback provided. Reasonable opportunity has been given for response. No action required.	3rd formal notification 08/03/19: Spectrum provided the 3rd formal notification to [redacted] as per the DEDJTR email incoming stating that [redacted] is replacing [redacted]. Spectrum consider DEDJTR a relevant stakeholder and will continue to provide DEDJTR project updates regarding the proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to DEDJTR and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Victorian Department of Environment, Land, Water and Planning (DELWP) [redacted]	09/02/18 11/06/18 14/06/18 03/07/18	1st formal notification 1A General 2nd formal notification 2B	No response was received in response to the first consultation letter sent on 09/02/18. Via email 14/06/18:	DELWP expressed interest in providing feedback on the proposal to Spectrum. DELWP's expression of interest to provide feedback is merited due to potential for survey to	Via email 03/07/18: Spectrum responded to DELWP stating that a response within four weeks would be sufficient and noted that additional information could be provided if needed. Refer to the rows below regarding follow-up with DELWP.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	03/07/18 03/07/18	Government Agencies Email incoming Email outgoing Email incoming Email outgoing	In response to the second stakeholder consultation letter sent on 11/06/18, the DELWP expressed interest in providing feedback on the proposal and asked Spectrum when a response was needed. Via email 03/07/18: DELWP notified Spectrum that the actioning officer for the proposal was currently on leave and a response would be supplied as soon as possible.	impact the Victorian coast and marine environment. No action required.	
	19/07/18 19/07/18 19/07/18	Email outgoing Email incoming Email outgoing	Via email 19/07/18: In response to Spectrum's enquiry on status of DELWP's response, they advised Spectrum that the actioning officer was working on the feedback and would provide the response in the coming days.	No new objections, claims or feedback. Reasonable opportunity has been given for response. No action required	Via email 19/07/18: Spectrum followed up with DELWP to ask if whether DELWP had their response ready to pass on to Spectrum. Via (second) email 19/07/18: Spectrum thanked DELWP for their assistance.
	20/07/18 24/07/18	Phone call incoming Email outgoing	Via phone 20/07/18: DELWP called Spectrum to inform them of their main interest surrounding noise impacts on cetaceans, and that this information would be included in their response to Spectrum. They requested the consultation letter be sent again for them to review.	DELWP expressed that their main concern was regarding noise impacts on cetaceans and reaffirmed their intention to provide formal feedback. DELWP's concerns regarding the potential noise impacts on cetaceans is merited. Action: Spectrum to ensure that noise impacts to cetaceans have been adequately addressed in the EP and provide DELWP with information on the noise impact assessment.	Via email 24/07/18: In response to DELWP's phone call made on 20/07/18, Spectrum provided a copy of the second stakeholder consultation letter to the officer, which included a summary of the noise impact assessment on cetaceans, including the control measures adopted.
	30/08/18 30/08/18 30/08/18	Email incoming Email outgoing Email incoming	Via email 30/08/18: DELWP emailed confirming their interest in still providing comments, despite having fallen behind due to other work and personnel on leave and asked if it was too late to provide feedback. Via email 30/08/18: DELWP apologised for not providing feedback sooner and stated they would be in touch with their comments soon.	DELWP reaffirmed their intention to provide formal feedback. DELWP's intention to provide feedback is merited. Action: Feedback has not been received to date, however Spectrum will ensure that any objections or claims raised by DELWP will be assessed for merit and addressed with DELWP as part of the ongoing consultation process.	Via email 30/08/18: Spectrum responded to DELWP's concerns about missing out on the opportunity to comment and stated that their feedback would be addressed regardless of when it is provided (i.e. as part of the ongoing stakeholder consultation process). Spectrum will continue to consult with DELWP and will ensure that any objections or claims raised by them are assessed for merit and addressed as part of the ongoing consultation process.
	08/02/19 14/03/19 14/03/19 14/03/19	3rd formal notification 3A General Email outgoing Email incoming Email outgoing	Via email incoming 14/03/19: Automated response from DWELP employee stating they are on maternity leave and to forward the email to an additional email provided. No response received in response to third formal notification sent to DELWP on 8th February 2019	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to DELWP's feedback (once received) to the email sent 14/03/19 in ongoing consultation.	Spectrum will continue to consult with DELWP and will ensure that any objections or claims raised by them are assessed for merit and addressed as part of the ongoing consultation process. Via email outgoing 14/03/19: In response to the DWELP comments that their interest surrounding impacts on cetaceans made during a phone call on the 20/07/19. Spectrum provided DELWP with a summary as to how the risks assessment has been undertaken, minimising sound exposure risks to whales and the mitigation methods in place to reduce impacts to whales. Description of the assessment method of risks and impacts: Definition of the activity and identification of associated aspects and hazards with the potential for environmental harm Identification of the environmental values within that area that may be affected Identification of aspects of the activity with potential for environmental harm Definition of acceptable levels for each impact and risk Identification of impacts from routine aspects and risks from unplanned/ accidental events, and the inherent impact or risk. Identification of the decision context and assessment technique relevant to the impact or risk Identification of the control measures to be implemented for each aspect in order to reduce the impacts and risks to ALARP Determination of the residual risk of each environmental impact and risk with identified control measures adopted Determination of whether the risk is acceptable In the event that an impact or risk is not considered acceptable, further practical control measures are considered and adopted until the impacts and risks are considered ALARP and acceptable. Minimising sound exposure risks –Whales

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Impacts to marine fauna from anthropogenic noise (Seismic) are relatively well understood for some marine fauna group (e.g. marine mammals), with the exception of marine mammals during sensitive behavioural processes (e.g. calving). The EP assessment considers the environmental impact to the location specific environmental values and sensitivities of the Activity EMBA (e.g. likely encounter with foraging pygmy blue whales). a precautionary approach has been applied to augment decision making further where uncertainty continues to exist. Spectrum has applied a precautionary approach in managing potential impacts with pygmy blue whale (PBW) aggregations with the application of additional control measures for reducing potential impacts form underwater sound from seismic operations. These controls include measures for relocation of the vessel in the event >15 whales are present int eh observation zone during pre-start observation check, precautionary shut-down procedures, adaptive management including Passive Acoustic Monitoring and monitoring of upwelling events. Passive Acoustic Monitoring System (PAM) Spectrum will utilise PAM as a control to mitigate impacts to pygmy blue whales that might be present in the operational area during operations. PAM operators will work closely with the visual observation team (marine fauna observers, MFOs) to identify and locate vocalising marine mammals to determine if they are within the shutdown or low-power zones. PAMGuard software will also be used to provide increased confidence in detections, classifications and localisation of marine mammal vocalisations in real time. The combination of PAM (and PAMGuard) with visual observations will provide an effective control of operations and ensure that the survey meets the requirements of the EP in ensuring appropriate mitigation actions are undertaken when marine mammals are detected within the specified mitigation zones Thermal Imaging Camera System Spectrum is proposing a combination of two or more methods to improve detection probability for real-time monitoring, and to help ensure an “in-time detection” of cetaceans during periods of low visibility/ night. A dual camera thermal imaging system will be implemented on the chase vessel to observe cetaceans during periods of low visibility and at night time. In optimal conditions, medium sized whales will be detectable reasonably well in up to 1.5km, and larger whales with reliable detection rages at 2km. Reliable detection of small whales and dolphins should be possible up to 500m and pinnipeds at <500m. The selected system consists of a dual visual/infrared system with HD and thermal imaging cameras, enabling both day and night monitoring up to 360º coverage. Distance estimation software incorporated into the system to provide objective and recordable distance estimation on the sea surface and an overlay of the EPBC Policy statement 2.1 precautionary zones. Monitoring of the Upwelling The survey environmental advisor (SEA) will monitor MODIS sea surface temperature (SST_ ad chlorophyll-a (Chl-a) heat maps on a daily basis throughout the survey to detect periods of upwelling (low SST and high Chl-a) close to the coast. This monitoring information will be used to inform Spectrum’s understanding of the region and when the upwelling season starts, and the link between SST/Chl-a, upwelling events and the possible presence of pygmy blue whales. The information will inform management measures for the following season’s survey and interrogated to determine if there are any lags between upwelling events and whales seen/detected. Via email outgoing 14/03/19: Spectrum forwarded the email described above sent on 14/03/19 to the email address provided in the automated response from the DELWP employee [redacted] sent on the 14/03/19. DELWP is a relevant stakeholder and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to DELWP and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
Victorian Office of the Minister for Resources [redacted]	09/02/18 01/06/18	1st formal notification 1A General 2nd formal notification 2B Government agencies	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	01/02/19 07/03/19 07/03/19	3rd formal notification 3A General Phone call outgoing Email outgoing	No response was received in response to the 3rd formal notification sent to [redacted] on 1st February 2019. Via Phone call outgoing: A follow up phone call was made on 7th March 2019 to determine if the information had been received. Representative of the minister stated that she was unsure if she had seen the latest update and requested the package be resent. No response has been received to date in response to follow up email sent 7th March 2019.	A representative of the minister requested for the consultation update sent on the 1st February be resent. Representative of the minister also requested a follow up call. Action: Spectrum to re-send latest stakeholder update (3rd formal notification) and to follow up with phone call. The requests of the representative of the minister are merited.	Via phone call outgoing 07/03/19: Spectrum explained to the representative of [redacted] the reason for the call, to follow up on previous consultation that has been sent to the minister. At the request of the representative, Spectrum resent the 3rd formal notification to the email address previously provided on the 7th March 2019. Via email outgoing 07/03/19: Spectrum provided [redacted] with the 3rd formal notification as well as a documentation of the phone call that had been undertaken with a representative of the office. The representative informed Spectrum that she would forward the information left with her to the relevant person [redacted] and that someone from the office would be in touch. Spectrum will attempt to send a reminder to [redacted] office next week if Spectrum have not heard anything from you, failing that, you should receive updates intermittently as the proposal progresses and as the survey gets underway. Spectrum will continue to keep [redacted] informed and updated on the project's status and will follow up with additional phone calls as per the ongoing consultation period.
		Ongoing consultation: Spectrum will continue to provide project updates to the Victorian Office of the Minister for Resources and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Government agencies – fisheries					
Australian Fisheries Management Authority (AFMA) [redacted]	09/02/18 11/03/18 09/04/18	1st formal notification 1A General Phone call outgoing Email outgoing	No feedback received in response to the first stakeholder consultation letter. Via phone 11/03/18: In response to Spectrum's request for catch and effort data (via phone), AFMA advised that it was unlikely spatial data could be provided for the operational area but that they would discuss the request with their licencing division and provide what information they could.	Spectrum is engaging AFMA about the provision of data and licence holder information. AFMA's indication for provision of data if available is merited	Via phone call outgoing 11/03/18: Spectrum enquired about obtaining catch and effort data. Via email on 09/04/18: Spectrum requested the following data (and provided AFMA with boundary coordinates and a location map): catch and effort data (09/04/18) data for the number of currently active licence holders within the operational area (for several fisheries) (09/04/18) Spectrum also noted that whilst it is at AFMA's discretion to provide the data, that [redacted] (SETFIA) had advised that this information is available upon request. AFMA have not provided the data requested.
	01/06/18 10/07/18 10/07/18 17/07/18 19/07/18 19/07/18 23/07/18 24/07/18 27/07/18 27/07/18 27/07/18 30/07/18 31/07/18 31/07/18 31/07/18	2nd formal notification 2B Govt & 2C Fishers Phone call outgoing Email outgoing Phone call outgoing Phone call outgoing Email outgoing Email incoming Email outgoing Email incoming Email incoming Email outgoing Email outgoing Email incoming Email outgoing Email incoming	No feedback received in response to the second stakeholder consultation letter. Via phone calls on 10/07/18, 17/07/18 and 19/07/17: AFMA providing advice on the process of obtaining contact details for specific licence holders. Via emails on 23/07/18, 27/07/18 and 31/07/18: In response to Spectrum's request for contact details of SSJF licence holders, AFMA advised they would be able to provide the details, provided information on costs, and invoices and stated payment was required before Spectrum would be given the details. Via emails on 27/07/18 and 31/07/18: AFMA provided the details to Spectrum and receipt of payment.	No objections or claims, Spectrum is engaging AFMA about the provision of data and licence holder information.	Via phone calls on 10/07/18, 17/07/18 and 19/07/17: Spectrum enquired about AFMA providing contact details for specific licence holders. Via emails on 10/07/18, 19/07/18 and 30/07/18: Spectrum made the following formal information requests to AFMA: contact details for SSJF licence holders (requested formally via email on 10/07/18 and 19/07/18) additional contact details for additional SSJF licence holders (requested formally via email on 30/07/18). Spectrum made the relevant payments on 27/07/18 and 31/07/18 respectively and received the information requested. This stakeholder is considered relevant and will continue to receive project updates from Spectrum.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	31/01/19	Phone call outgoing	Via Phone call outgoing 31/01/19: [redacted] Manager of the SESSF at AFMA explained that there are both Quota Holders in the fishery and Boat Licence holders. AFMA representative explained that the fishermen that only hold a quota licence and do not own or lease a boat licence are not actively fishing their quota. Only those licence holders or lessees that hold a boat licence or lease a boat licence are the ones that are actively fishing. AFMA Representative explained that to capture the licence holders that are actively fishing, to purchase the licences for those that are leasing or own a boat licence. AFMA representative explained that if they do not hold or lease a boat licence then they are not allowed to fish under their SESSF quota licence, they must also hold or lease a boat licence. the AFMA representative agreed that all the licence holders, whether they are quota holders or boat licence holders or leasers they all have an interest in the fishery and that the purchase of all licence holders would be appropriate.	No objections or claims, Spectrum is engaging AFMA about the provision of data and licence holder information.	Via phone call outgoing 31/01/19: Spectrum asked AFMA to explain the difference between the quota holders and the boat holders. Spectrum thanked AFMA representative for explaining the differences between quota holders and boat holders. Spectrum explained that contact needs to be made with all stakeholders who's function interest or activities may be impacted by the proposed survey, so although the quota holders are not actively fishing, they still have an interest in the fishery so Spectrum would need to purchase details for all licence holders to ensure all are covered. Spectrum thanked AFMA representative for the explanation of the fishery and stated a request for purchasing the 225 licence holders' details would be following the phone call.
	31/01/19 31/01/19	Email outgoing Email incoming	Via email incoming: 31/01/19: AFMA representative responded to the request for licence holder details from Spectrum, stating the approval to release the licence holder details shouldn't take long and the invoice will be provided shortly.	No objections or claims, Spectrum is engaging AFMA about the provision of data and licence holder information.	Via email outgoing 31/01/19: Spectrum thanked AFMA representative for their explanation of the fishery. Spectrum provided the AFMA representative with the list of licence holders that the licence holder details are requested for, as well as the invoice to be paid.
	31/01/19 31/01/19 31/01/19 31/01/19 04/02/19 04/02/19	Email incoming Phone call outgoing Email outgoing Email incoming Email outgoing Email incoming	Via email incoming 31/01/19: AFMA representative provided Spectrum with the invoice for 19 licence holders to be paid and to release the licence holder details once payment had been made. Via Phone call outgoing 31/01/19: AFMA apologized for not reading the email correctly and stated that the application for 227 licence holders will be processed and a new invoice will be issued. AFMA representative confirmed that Spectrum wanted to purchase 227 licence holders and explained that only the boat holders or leasers are actively fishing not the quota holders. AFMA representative stated that a new invoice would be issued following the phone call. Via email incoming 31/01/19: AFMA representative provided Spectrum with the amended invoice. Via email incoming 04/02/19: AFMA provided Spectrum with the licence holder details for 224 stakeholders including the late addition as 4 of the licence holders on the SESSF concessions holder list are no longer wanting to be contacted as they will not be fishing any more or are in receivership. AFMA stated a refund would be issued for the licence holder details that had been paid for but are not to be contacted. AFMA stated that a refund would be paid to the account details they had received payment from.	No objections or claims, Spectrum is engaging AFMA about the provision of data and licence holder information.	Via phone call outgoing 31/01/19: Spectrum contacted AFMA representative that had sent thorough the invoice to be paid that all 227 licences were needing to be purchased, not just the 19 licences that had been highlighted green in the spreadsheet provided. Spectrum explained the reasoning behind the 19 highlighted licence holders. the 19 licence holders were highlighted to differentiate between the small pelagic fishery and the SESSF licence holders that needed to be purchased in case AFMA needed to separate the lists. Spectrum informed the AFMA representative that all 227 licences were required as quota holders do hold an interest in the fishery and are therefore are potentially relevant stakeholders. Via email outgoing 31/01/19: Spectrum contacted AFMA representative after phone conversation detailing the correct contact details for the invoice to be paid out to and confirmed the request for 227 licence holder details to be purchased. Via email outgoing 04/02/19: Spectrum provided AFMA with the paid invoice to purchase 227 licence holder details. Spectrum informed AFMA that one licence holder had been missed from the list and an additional licence holder details would need to be purchased. Spectrum requested an additional invoice for the additional stakeholder that had been missed.
	01/02/19	3rd formal notification 3A General	No response has been received in response to the 3rd formal notification sent to AFMA on the 1st February 2019.	No objections or claims, Spectrum is engaging AFMA about the provision of data and licence holder information.	AFMA is considered a relevant stakeholder and will continue to receive ongoing updates regarding the proposed survey.
	11/02/19 19/02/19 19/02/19 25/02/19 01/03/19 08/03/19 11/03/19	Email outgoing Email incoming Email incoming Email outgoing Email outgoing Email incoming Email outgoing	Via email incoming 19/02/19: AFMA representative responded to Spectrum's request assigning an AFMA employee to look into this request Via email incoming 19/02/19: AFMA representative in charge of this request responded to Spectrum's request stating that the following website (https://www.afma.gov.au/about/fisheries-management-policies/information-disclosure-fisheries-management-paper) contains AFMA's Information Disclosure Policy and defines the minimal scale at which data is provided. Furthermore if Spectrum required data at a scale finer than what is defined by the policy, a request would be assessed by AFMA management accordingly. AFMA representative attached the data request form for Spectrum to complete. 08/03/19:	No objections or claims, Spectrum is engaging AFMA about the provision of data and licence holder information.	Via email outgoing 11/02/19: Spectrum contacted AFMA representative to obtain catch data for individual species for the Commonwealth trawl and scaefish hook sectors of the SESS, (specifically blue grenadier, silver warehou, Gould's squid, pink ling, blue-eyed trevalla, ribaldo). Spectrum requested to determine what spatial and temporal scale this data is provided in. Via email outgoing 25/02/19: Spectrum presented AFMA representative with completed data request form. Spectrum requested that AFMA provide estimated costs and time frames associated with this request. Via email outgoing 01/03/19: Spectrum requested a response from AFMA regarding the request for data and submitted data request form as no response had been received.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			AFMA responded to Spectrum's request for an update as to where the data request is, and costs associated with it. AFMA representative stated that they are chasing up the request with the fisheries and data managers and hope to have a response shortly. AFMA representative apologised for the delay.		Via email outgoing 11/03/19: Spectrum contacted AFMA representative querying the progress on the data request submitted 25th February 2019. Spectrum restated the request for costs and time frames for obtaining the data.
		Ongoing consultation: Spectrum will continue to provide project updates to AFMA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
AFMA - South East Management Advisory Committee (SEMAC)	09/02/18 01/06/18 01/02/19 07/03/19	1st formal notification 1A General 2nd formal notification 2C Fishers 3rd formal notification 3A General Phone call outgoing	No feedback or response received to the 1st, 2nd and 3rd formal notifications sent to SEMAC on 9th February and 1st June 2018 and 1st February 2019. No response received in response to phone call outgoing on 7th March 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to SEMAC and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Primary Industries and Regions SA (PIRSA) [redacted]	27/02/18 07/03/18 10/04/18	1st formal notification 1A General Letter incoming Email outgoing	Via letter 07/03/18: In response to the first stakeholder consultation letter, PIRSA noted that the proposed 9,000 km^2 survey overlaps spatially and temporally with several commercial fisheries, and as such there may be impacts from seismic surveys in the proposed area. PIRSA commented on research reports published on the impacts of seismic surveys on commercially important fish stocks and zooplankton released in 2016 and 2017, noting that while they are very specific and must be considered in the context of broader international body of literature, they indicate that further research is required to understand the medium and long-term effects on invertebrate and fish species populations. PIRSA stated the area proposed overlaps with the southern bluefin tuna, which migrate across the southeast of the GAB and is targeted by Commonwealth, recreational and charter fishermen. Recommended the survey be timed and located to minimise potential impacts on important biological processes, including fish spawning and migration pathways. Provided information on the fish spawning periods and planktonic larvae of key South Australian fish stocks including King George Whiting, snapper and sardines. Requested that Spectrum keep the following additional South Australian fishing industry associations informed of the proposal: Southern Zone Abalone Management Inc Marine Fishers Association of South Australia Central Zone Abalone Fishery Abalone Industry Association of SA Inc South Australian Northern Zone Rock Lobster Fishermen's Association. RecFishSA	PIRSA has provided information on the overlap of the survey area with various fisheries, noted further research was required on the impacts of seismic surveys on fish species, requested the survey be timed and located to minimise impacts and suggested further stakeholders to consult. PIRSA's concerns raised and recommendations for additional consultation are merited. Merited due to potential for survey to impact SA fish stock. Action: Spectrum ensure that the EP includes a thorough literature review of available research and demonstrates that the potential impacts on important biological processes, including fish spawning and migration pathways are reduced to ALARP. Spectrum to ensure southern bluefin tuna is included in the impact assessment. Action: Spectrum to review the overlap of fisheries with the survey area and consult with fishermen to ensure the survey location and timing reduces impacts to ALARP. Action: Spectrum to review the stakeholders recommended for consultation and incorporate into stakeholder consultation process.	Via email 10/04/18: Spectrum advised that commercial fisheries overlapping the proposed survey area would be considered in the EP and the potential impacts to each reduced to ALARP. Spectrum noted they were aware of the new literature published on the effects of seismic on invertebrates and zooplankton and the implications of the findings of these publications would be addressed in the EP. Spectrum asked if it was possible for PIRSA to provide further information on the migratory movements of southern bluefin tuna through the survey area and when they are likely to occur, as well as the different life stages of southern bluefin tuna. Data request is addressed in the row below. Spectrum confirmed that the survey will be managed to minimise potential impacts on important biological processes to ALARP. Action Outcomes: Spectrum have since ensured that the recent research referred to has been addressed in the impact assessment in the EP. No research has demonstrated links between seismic surveys and medium or long-term commercial fishery outputs, however to address uncertainty in the assessment of acoustic impacts to fish populations a precautionary approach based on worst case scenarios was applied in impact assessment. Spectrum have ensured that southern bluefin tuna have been addressed in the impact assessment in the EP, including potential impacts to southern bluefin tuna fishermen. The information on spawning periods provided by PIRSA has been incorporated into the EP and control measures have been adopted to minimise the potential impacts of the proposed survey on fish spawning. These are in Section 6.2. Spectrum notified all the additional stakeholders requested by PIRSA and will continue to ensure they are kept informed on the activity. Those identified as relevant are included in this table.
	16/05/18 24/05/18	Email incoming Email outgoing	Via email 16/05/18: In response to Spectrum's enquiry about data for southern bluefin tuna, PIRSA replied they were not aware of any additional information regarding the migratory movements through the survey area. Noted that research on southern bluefin tuna has been undertaken as part of the GABRP and suggested that these may include relevant information.	No new objections or claims. PIRSA has provided information on southern bluefin tuna research.	Via email 24/05/18: Spectrum acknowledged the response and advised that copies of the GABRP reports had been considered in the preparation of the EP. Spectrum stated they will provide PIRSA with additional information on the Otway Deep MSS EP, including assessments of the potential impacts identified for relevant fisheries and the control measures proposed to mitigate them.
	01/06/18 11/06/18 13/06/18 16/07/18	2nd formal notification 2C Fisheries Email outgoing Email incoming	No feedback received in response to the second stakeholder consultation letter. Via email 13/06/18: In response to the email outgoing from Spectrum, PIRSA stated that in order for the data request to be considered, an application would	No new objections or claims. Spectrum is engaging PIRSA about the provision of data.	Via email 11/06/18: Spectrum request catch and effort data for all target species landed by each South Australian fishery over the last 10 fiscal years from PIRSA. Via email outgoing 16/07/18:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Email outgoing	need to be completed and submitted to SARDI. PIRSA included the contact details for the relevant person at SARDI.		Spectrum thanked PIRSA for their assistance in submitting the data request to SARDI. Spectrum informed PIRSA that the request had been submitted and that ongoing consultation will be conducted with both PIRSA and SARDI. This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	01/02/19	3rd formal notification 3A General	No feedback has been received in response to the 3rd formal notification sent to PIRSA on the 1st February 2019.	No new objections or claims. No action required	PIRSA is a relevant stakeholder and will continue to receive project updates from Spectrum.
	14/03/19	Email outgoing	No response has been received in response to the email outgoing sent to PIRSA on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to PIRSA's feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19: Following the email outgoing form Spectrum on 24/05/18, Spectrum indicated that additional information on the Otway Deep MSS EP, including assessments of the potential impacts identified for relevant fisheries and the control measures proposed to mitigate them would be sent through to PIRSA. Spectrum provided PIRSA with the following information on the 14th March 2019. Spectrum's response included the potential impact to SA fisheries, controls to minimise potential impacts of seismic activities on fish and fisheries, impacts to plankton (incl. larvae and eggs) and spawning and impacts to spawning. Potential impacts to SA fisheries from seismic operations – sound Based on modelling results and comparisons with research thresholds, localised effects on the catchability of commercially important finfish species within the survey area (pelagic or demersal) will be limited to a small radius on the seabed around the location of the airgun. Spectrum provided PIRSA with the fisheries potentially occurring within the area impacted by seismic noise table directly from the EP Controls to minimise potential impacts of seismic activities on fish and fisheries The following management measures are proposed to avoid long-term (> 1 month) displacement of fishers and avoid potential conflict with fishing activities or loss of fishing equipment Spectrum will notify all relevant persons four weeks prior to the start of the survey of the survey details including, timing, location and duration Fishers actively operating in the survey area will be issued a 7 to 10 day forecast prior to activities commencing in the survey area, and will be kept informed of daily survey activities through Spectrum's 24-hour look-ahead communication process Spectrum will continue to advise relevant fishers of planned sail-lines and dates and if any issues are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflicts. Controls to be considered will include: Moving to another sail line Deviating around fishing activity area by 3km Allowing fishers to fish area prior to seismic acquisition Minimise survey activity areas where there is known fishing activity A support vessel will accompany the survey vessel and manage interactions with other marine users' vessels transiting near the seismic vessel or streamers. Spectrum will pay compensation to the rightful owner of any fishing equipment that has been damaged beyond repair or lost due to survey activities, and for associated loss of catch To minimise disruption to spawning activity of commercially important fish species, survey activities will commence inshore and survey lines shallower than 500m will be completed prior to the start of December. This reflects the fact that most commercial fish species spawn in waters <400m depth, and those that spawn before December have main spawning grounds away from the survey area. The exception is pink ling which has an extended spawning period from March to October. Impacts to plankton (incl. fish larvae and eggs) and spawning The potential impacts of seismic surveys on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the airgun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to diel migration of plankton (including fish larvae) between surface and deep waters.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Consequently, predicting impacts is difficult due not only to the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey. Although the recent work by McCauley et al. (2017) and Richardson et al. (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. Impacts to spawning The potential mortality of larval fish that rely on zooplankton for food is difficult to predict but is not expected to affect a significant proportion of larvae based on the assumption that not all zooplankton are killed by exposure to airguns (around 22% to 35%, depending on ocean circulation; Richardson et al. 2017), only a very small proportion of the plankton would be exposed at any one time, and that zooplankton populations are likely to begin to recover rapidly following completion of a seismic survey due to fast growth rates, combined with dispersal and mixing of zooplankton from both within and without the area of effect. Richardson et al. (2017) showed that zooplankton communities can begin to recover during the survey period during periods of good oceanic circulation (and periods of upwelling), and therefore a continuous decline is zooplankton throughout the survey period is not anticipated and parts of the survey are would progressively recover during the survey. It is unlikely there would be localised patches of reduced food availability for plankton feeders over the period of the survey and during the 3-day recovery period (as modelled by Richardson et al. (2017)). No population level effects are expected in commercially caught finfish species, or to their catch rates as an indirect result of impacts on eggs/larvae. Based on the results of the modelling and research thresholds, impacts to these species, particularly at the population level, is expected to be negligible. A control is in place on survey operations to avoid surveying waters shallower than 500 m depth after the start of December to reduce impacts on spawning. Survey will not be carried out during peak spawning periods for target species commercially fished, or does not overlap important areas. Species able to be fished in the survey area do not spawn within the south-east marine region (such as tuna, billfish, gemfish west, John dory and mirror dory) or during the proposed survey window (such as blue warehou, sawshark and ribaldo). PIRSA is considered a relevant stakeholder and will continue to receive updates from Spectrum regarding the proposed Otway Deep seismic survey.
		Ongoing consultation: Spectrum will continue to provide project updates to PRISA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
PIRSA – South Australian Research and Development Institute (SARDI) [redacted]	28/06/18 29/06/18 29/06/18 29/06/18 02/07/18 02/07/18 02/07/18 25/07/18 25/07/18 08/03/19 08/03/19	Email outgoing Email incoming Email outgoing Phone call outgoing Phone call outgoing Email incoming (x3) Email outgoing (x2) Email incoming Email outgoing 3rd formal notification 3A General Email incoming	Via email incoming 29/06/18: SARDI representative responded to Spectrum's request for catch and effort spatial data for all target species landed by each SA fishery over the last 10 fiscal years. SARDI responded to Spectrum stating they attempted to contact a Spectrum representative today, however they were unsuccessful at contacting the representative and will attempt to call again next week. Via email incoming 02/07/18: SARDI followed up the phone call with Spectrum, supplying Spectrum with an updated data request form with the correct sections filled out to acquire the data Spectrum requires. SARDI requested the Spectrum representative to complete the form and return it to SARDI. Via email incoming 02/07/18: SARDI responded to the data request provided by Spectrum stating that the document was needing to be signed before being submitted and requires the Spectrum representative to resubmit the form complete with signature. Via email incoming 02/07/18:	No objections or claims, Spectrum is engaging SARDI about the provision of data.	Via email outgoing 28/06/18: Spectrum sends a completed request form for catch and effort spatial data for all target species landed by each SA fishery over the last ten fiscal years. Via email outgoing 29/06/18: Spectrum responded to SARDI's email stating the Spectrum representative SARDI attempted to contact was away and that Spectrum would like to discuss the data request. Via phone call outgoing 29/06/18: Spectrum called SARI to discuss the data request submitted on the 28/06/18 Via phone call outgoing 02/07/18: Spectrum contacted SARDI to discuss the type of catch and effort data available for each fishery, as a result amendments were made to the data request submitted to suit this new request. Via email outgoing 02/07/18: Spectrum returned the completed data request form to SARDI. Via email outgoing 02/07/18 Spectrum returned the completed and signed data request form to SARDI. Via email outgoing 25/07/18:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			SARDI informed Spectrum that the data request has been received and that SARDI will be in contact if there are any issue with the request. Via email incoming 25/07/18: SARDI provided all non-confidential data requested by Spectrum, noting that certain data of a confidential nature was not supplied.		Spectrum thanked SARDI for providing the data and noted the limitations regarding confidentiality. Via email incoming 08/03/19: Automated response to 3A notification.
		Ongoing consultation: Spectrum will continue to provide project updates to SARDI and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) [redacted]	09/02/18 27/02/18 01/06/18 11/06/18 14/06/18 09/07/18 09/07/18 09/07/18	1st formal notification 1A General 1st formal notification 1A General 2nd formal notification 2B Government Agencies & 2C Fisheries 2nd formal notification 2A General Email incoming Email outgoing Email incoming Email outgoing	Via email 14/06/18: In response to the second stakeholder consultation letter, the DPIPWE stated they had an interest in further discussing the proposal and requested being contacted by a member of the project team to discuss questions they had in relation to the proposal, the consultation process and the provision of comment, as well as opening a dialogue in relation to concerns held for potential impacts that occur as a result of the proposed activity being undertaken. DPIPWE enquired as to previous consultation that had been undertaken with the department. Via email 09/07/18: Autogenerated email noting the officer was out of the office on leave and to contact an alternative officer.	DPIPWE have requested contact from Spectrum to discuss aspects of the proposal. DPIPWE's concerns regarding the potential impacts that can occur as a result of seismic surveys are merited. Merited due to potential for impact of survey in TAS waters.. Action: Spectrum to contact DPIPWE to discuss the issues raised.	Via emails 09/02/18 and 11/06/18: Stakeholder consultation packages were sent to DPIPWE contact [redacted]. Via emails 27/02/18 and 01/06/18: Stakeholder consultation packages were sent to DPIPWE contact [redacted]. Spectrum requested fisheries catch and effort spatial data from DPIPWE however understand they do not provide fisheries catch and effort spatial data other than that which is already publicly available (generally only for broad scale fishery assessment areas ~100 km^2) based on past advice. Via email 09/07/18: Spectrum acknowledged DPIPWE's email and apologised for the delay responding, noting there had been a recent change in personnel, and that Spectrum would be in touch shortly. Spectrum's response to concerns raised by DPIPWE are summarised in the rows below.
	13/07/18 13/07/18 13/07/18 13/07/18 13/07/18 13/07/18	Phone call outgoing Phone call outgoing Email outgoing Email incoming	Via phone call 13/07/18: Spectrum phoned DPIPWE to obtain contact details for the current acting officer. Via phone call 13/07/18: Spectrum phoned and the acting officer requested further information regarding on the consultation process, the legislative and statutory process for EP development for approval by the regulator and how the EP assessment will be undertaken by the regulator. Via email 13/07/18: Autogenerated email noting officer was out of the office on leave until 19 July 2018.	DPIPWE have requested further information on the consultation process. DPIPWE's request for further information is merited. Action: Spectrum to provide additional information on the consultation process.	Via email 13/07/18: Spectrum provided the acting officer with a summary of the stakeholder consultation process and Spectrum's decision-making process for identifying stakeholders as relevant or potentially interested. This information included a list of the fishing associations that had already been consulted with. Stakeholder consultation process Relevant stakeholders were initially identified by mapping overlap between the activity EMBA and stakeholder functions, interest or activities. A range of potentially relevant stakeholders with broad functions, interest or activities within the larger fuel spill EMBA, but not known to extend to the Activity EMBA were also identified in the process. Relevant stakeholders and potentially interested parties were identified under the following groups: Government and Agencies Fishers and Fisheries Conservation and Research Tourism and Recreation The activity EMBA overlaps the jurisdictional boundaries of several Commonwealth and State managed fisheries, however not all fisheries are active in the Activity EMBA. Respective fisheries management authorities (i.e. the Australian Fisheries Management Authority; Victorian Fisheries Authority; and commercial fishing industry associations were identified and consulted appropriately to determine potential effects on the biology and ecology of the fish species or commerciality of the fisheries. List of fishing associations already consulted Spectrum have engaged a Fisheries Liaison Officer, [redacted], as well as private consultant [redacted] (SETFIA CEO) to assist in consultation with fishers. Spectrum have also engaged with Seafood Industry Victoria and Tasmanian Seafood Industry Council through their CEO's [redacted] and [redacted]. Spectrum are engaging with the licence holders directly, through the FLO and Consultant's, as well as engaging with association bodies. Spectrum have engaged with a wide range of Industry Association organisations including the following: Southern Shark Industry Alliance Victorian Scallop Fisherman's Association

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Southeast Trawl Fishing Industry Association Marine Fishers Association Southern Rocklobster Limited (Covers all 3 jurisdictions) Seafood Industry Victoria Tasmanian Seafood Industry Council South Australian Rock Lobster Advisory Council Inc Victorian Rock Lobster Association Tasmanian Rock Lobster Fisherman's Association Great Australian Bight Industry Association Consultation has occurred through email, phone call and face to face meetings with relevant stakeholders Charter boat operators based in ports adjacent to the proposed survey area have also been contacted with regards to the project
	17/07/18 18/07/18	Email incoming Email outgoing	Via email 17/07/18: DPIPWE contacted Spectrum requesting how the formal assessment process works and how the views of stakeholders such as the fishing industry may be considered by the regulator.	DPIPWE have requested further information on the EP approvals process. DPIPWE's request for further information is merited. Action: Spectrum to provide additional information on the EP approvals process to DPIPWE.	Via email 18/07/18: Spectrum provided DPIPWE with an explanation of the regulator (NOPSEMA), of Spectrum's role and approach to consultation and information (including links) regarding the decision-making guidelines for acceptance of an EP by the regulator, and the regulators guidelines for consultation.
	26/07/18 27/07/18 07/08/18 07/08/18 08/08/18 08/08/18	Email outgoing Email outgoing Email incoming Email incoming Email outgoing Email outgoing	Via emails 07/08/18: DPIPWE provided Spectrum with licence holder numbers for state-based fisheries overlapping the proposed survey area. DPIPWE advised that the species of scalefish listed in the provided spreadsheet are not relevant to the area of the survey, as they are not caught in deeper shelf waters. They informed Spectrum that rock lobster fishers may take small quantities of scalefish, such as striped trumpeter, under their licences, and recommended that in consulting with them Spectrum should enquire as to what other species they catch that they feel may be relevant to potential impacts associated with the proposed activity. In a separate email [redacted] expressed disappointment about the lack of meaningful consultation, advising that one of the contacts which Spectrum had provided an information package to (27/02/18) had retired late in 2017. [redacted] expressed concern that greater effort to contact the State Government Agency with responsibility for managing a number of high-value fisheries within the zone of the proposed activity was not perused in a more timely manner, and provided the following feedback: concern that there is significant uncertainty around the potential for seismic survey of the nature proposed to cause significant impact on benthic crustaceans and resident fish species specific impacts may include physical damage affecting growth, reproduction and survival. Broader ecosystem impacts that may affect habitat and the food chain, and thereby indirectly affecting crab, lobster and fish are also possible directed Spectrum to research published by FRDC and IMAS and stated this research was sufficient to raise valid concerns regarding the potential for seismic surveys such as those proposed to impact resident benthic fauna and associated fish species as well as Tasmanian commercial fishing interests, there exist questions regarding impacts on other marine and migratory species including cetaceans, and he assumes that other stakeholders consulted will raise concerns in these areas.	DPIPWE have requested further information on the consultation with their department. DPIPWE also raised concerns regarding the effect if seismic on crustaceans, fish, cetaceans and the broader ecosystem. Request merited due to state-based fisheries overlapping survey area. Action: Spectrum to provide details of consultation with DPIPWE.	Via email 26/07/18 Spectrum requested if DPIPWE were able to confirm licence holder numbers for state operated fisheries to confirm with information already obtained and used in the EP. Via email 27/07/18 In response to earlier queries by DPIPWE (email incoming 14/06/18) into what previous consultation had been undertaken with the department, Spectrum provided DPIPWE with list of previous officers consulted with in the department. Via emails 08/08/18: DPIPWE Spectrum thanked DPIPWE for their assistance with data and provided the following in responses to [redacted] feedback: stated that Spectrum has endeavoured to undertake early, open and respectful consultation with all stakeholders including DPIPWE and will continue to keep you informed of activities as consultation progresses. stated that feedback obtained from stakeholders during this process plays an important role in the assessment and management of potential impacts from the proposed survey, and is an integral part of the Environment Plan. Re-sent the second stakeholder consultation letter which contains the control measures proposed to minimise impacts on the environment and relevant stakeholders, as well as Spectrum's response to TSICs consultation report to demonstrate that Spectrum has listened to stakeholder concerns, assessed the potential impacts with due regard to the scientific literature, and either modified survey methods or applied appropriate controls to manage the impacts.
	01/02/19 08/02/19	3rd Formal Notification 3A General 3rd Formal Notification 3A General	No response has been received in response to the email outgoing sent to DPIPWE on the 1st and 8th February 2019.	No additional feedback received, reasonable time has been given for a response. No action	DPIPWE is considered a relevant stakeholder and will continue to be updated regarding the proposed Otway Deep MSS.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Ongoing consultation: Spectrum will continue to provide project updates to DPIPWE and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Victorian Fisheries Authority (VFA) [redacted]	14/02/18 21/02/18 21/02/18 21/02/18 21/02/18 22/02/18 23/02/18 23/02/18 23/02/18 27/02/18	1st formal notification 1B VFA Phone call outgoing Follow up email Phone call incoming Email outgoing Email outgoing Email incoming Email incoming Email outgoing Formal request for data	Phone calls and emails on 21/02/18: The VFA confirmed the correct point of contact for future consultation, as one of their staff had departed. Via emails on 23/02/18: In response to Spectrum's email on 22/03/18, the VFA provided the following comments: confirmed that the survey area includes waters under their jurisdiction subject to active fishing, including Victoria's most valuable fishery i.e. rock lobster. agreed to provide catch data and information on the number of fisheries in the operational area but noted that they would only be able to provide data for that involves less than 5 fishers. stated they were not able to provide details on licence holders due to confidentiality and suggested SIV may be able to provide. supplied Spectrum with a copy of the VFA (2017c) Policy for Victorian Fisheries: Undertaking Seismic Surveys in Victorian Managed Waters, as requested. requested that Spectrum undertake effective consultation with fishers and key representative bodies about the potential impacts of the proposed operation on fish stocks and fishing operations. They noted that SIV can assist with consultation and that SIV may ask that other groups be consulted. provided contact details for representatives of key stakeholder organisations to consult; Seafood Industry Victoria, Apollo Bay Fishermen's Cooperative Society Ltd, Portland Professional Fishermen's Association, Victorian Rock Lobster Association, Western Abalone Divers Association and VRFish. The VFA noted the following general concerns of fishers regarding oil and gas industry activities; seismic operations, exclusion zones, drilling muds and cuttings disposal and infrastructure.	The VFA has provided information on their jurisdiction, consultation recommendations, comments on the available data and general issues relevant to fishers. The VFA's comments and suggestions provided to Spectrum are merited due to potential for survey to impact Victorian fisheries. Action: Spectrum to continue engagement about data and information. Action: Spectrum to review the stakeholder policy and stakeholders recommended for consultation and incorporate into stakeholder consultation process. Action: Spectrum to review general issues raised and ensure those relevant to the survey are addressed in the EP.	Phone calls and emails on 21/02/18: Spectrum confirmed the correct point of contact for future consultation regarding the activity. Via email 22/02/18: Spectrum forwarded the first stakeholder consultation letter and a request for a complete copy of the VFA (VFA 2017c) Policy for Victorian Fisheries: Undertaking Seismic Surveys in Victorian Managed Waters (weblinks were broken). Spectrum also asked if VFA could provide information on fisheries catch and effort, as well as licence holder contact details. In response to VFA's feedback provided on 23/02/18: Spectrum submitted a request on 27/02/18 for catch and effort data, number of currently active licence holders, spawning times and fisheries closures. Spectrum reviewed the actions and mitigation strategies for seismic surveys presented in the VFA (VFA 2017c) Policy for Victorian Fisheries: Undertaking Seismic Surveys in Victorian Managed Waters and incorporated them into the EP where appropriate. Information on spawning times and peak commercial fishing periods provided by VFA have also been incorporated into the EP. Spectrum has extensively consulted with fishers and key fishing representative bodies, including SIV. The details of consultation with relevant stakeholders are covered in this table. Spectrum notified all representatives of key stakeholder organisations recommended by the VFA and continues to engage with those identified as relevant as part of the ongoing consultation process. Spectrum considered the high-level concerns of fishers regarding oil and gas activities identified by the VFA and noted that impacts related to seismic operations and exclusion zones were relevant to the Otway Deep MSS. These issues have been addressed in the EP and were covered in the first and second stakeholder consultation letters provided to the VFA on 14/02/18 and 01/06/18 respectively. Drilling muds and cuttings disposal and infrastructure were not relevant to the Otway Deep MSS and have been not assessed in the EP or discussed with stakeholders.
	08/03/18	Email incoming	Via email 08/03/18: In response to Spectrum's data request (described in the row above, dated 27/02/18), the VFA provided catch and effort data, number of currently active licence holders, spawning times and fisheries closures.	No new objections or claims, Spectrum is engaging VFA about the provision of data and licence holder information.	The catch and effort information provided by the VFA on 08/03/18 has been incorporated into the EP where relevant, however was of limited use due to the course resolution of the available data (gridded cells ~18 km^2) and because there were many blanks in the cells within the operational and OBN placements areas as they included less than five fishers. For example, no information from 2017 was available for any of the cells overlapping the operational area.
	01/06/18 06/07/18 19/07/18 19/07/18 26/07/18 26/07/18 27/07/18 27/07/18 08/08/18 08/08/18	2nd formal notification 2C Fisheries Email outgoing Email incoming Email outgoing Email outgoing Email outgoing Email outgoing Phone call outgoing Email incoming Email outgoing	Via email 19/07/18: In response to Spectrum's enquiry about the VFA distributing information to licence holders (on 06/07/18), the VFA stated they were confident the engagement of SIV will ensure that all relevant commercial fishermen are aware of the project. They also suggested contacting recreational fishers and charter operators working out form Portland and Port MacDonnell, VRFish and local angling clubs. Via phone call 27/07/18: In response to Spectrum's request for further information the VFA indicated they would look over the request and will attempt to confirm licence holder numbers of state-based fisheries that overlap the survey area. Via email 08/08/18: In response to Spectrum's emails and phone calls on 26/07/18 and 27/07/18, the VFA provided a revised table with notes on the source of the numbers provided, such as: for the quota managed fisheries (rock lobster, abalone and giant crab) VFA nominated operators who can be the licence holder and/or another person and noted that there can be multiple operators listed on a licence, and that operators can also work for multiple licence holders. for the non-quota fisheries, the only way to determine active fishers was to look at the 2017/18 data to determine how many people fished	No new objections or claims; however, the VFA provided information and advice on engaging with fishers. The VFA's provision of information is merited due to potential for survey to impact Victorian fisheries. Action: Spectrum to incorporate this feedback into the consultation process and in the compilation of the EP.	Via email 06/07/18: Spectrum asked VFA if they could distribute stakeholder consultation letters to all fishermen within the VFA jurisdiction to ensure all fishermen have been covered by consultation and are aware of the project. Via email 19/07/18 Spectrum thanked VFA for their assistance in providing potential additions to the stakeholder list and explained contact would be made with relevant stakeholders as soon as possible. Via emails 26/07/18 and 27/07/18: In response to VFA's email dated 19/07/18, Spectrum confirmed that consultation had already been undertaken with charter operators and recreational fishers. Therefore, Spectrum contacted the VFA, explained feedback from NOPSEMA and SIV regarding the identification of all relevant licence holders, and asked the VFA if they could assist in identifying licence holder numbers for state-based fisheries overlapping the survey area. Spectrum provided draft table of fisheries and numbers of licence holders based on information available on the VFA website and asked if the VFA could verify the information and confirm the total number of licence holders, the number of active licence holders, and the number of active operators (fishers) for the relevant fisheries. Spectrum also provided information provided by SIV as an indication of the number of licence holders they consulted with. Via email 08/08/18:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			under each licence. They noted that this can change year to year, so the data is only reflective of the most recent year and the active number of fishers can be as high as the number of active licences in any year. The VFA also stated the following: numbers of stakeholders SIV consulted should be sufficient to meet your consultation requirements. there are several inactive ocean scallop and ocean access licences, however SIV has still sent the information to most licence holders. They noted that this is what the VFA would do, because although fishers may not currently be active, they may fish at any time and they are interested in knowing what is happening in areas which they are entitled to fish.		In response to the data and feedback from the VFA, Spectrum replied that the combination of SIV consultation and previous consultation via [redacted] and [redacted] should have covered all relevant fishers (both inactive and active).
	20/09/18 24/09/18 25/09/18	Email outgoing Email incoming Email outgoing	Via emails 24/09/18: In response to Spectrum's request on 20/09/18, the VFA provided the requested catch data for giant crab and southern rock lobster.	No new objections or claims, the VFA provided data requested. Action: Spectrum to incorporate data into the consultation process and in the compilation of the EP.	Via email 20/09/18: Spectrum requested additional catch data from the VFA for giant crab and southern rock lobster. Via email 25/09/18: Spectrum thanked the VFA for the data. Spectrum have since used the data to progress consultation with giant crab and southern rock lobster licence holders and their feedback has been incorporated into the EP. The outcomes of consultation are summarised in this table under the relevant stakeholder organisation. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd Formal Notification 3A General	No response has been received in response to the email outgoing sent to VFA on the 1st February 2019.	No additional feedback received, reasonable time has been given for a response. No action	VFA is considered a relevant stakeholder and will continue to be updated regarding the proposed Otway Deep MSS.
	14/03/19	Email outgoing	No response has been received in response to the email outgoing sent to VFA on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to VFA's feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19: In response to the VFA's comments regarding "fishers particularly concerned about the impacts of seismic, drilling muds and cuttings disposal, the impact of infrastructure such as pipelines and disruption to business through exclusion zones, raised on the 23rd February 2018. Spectrum provided VFA with a summary of the effects of seismic noise and proposed control measures to minimise disruption to fisheries through various methods explained further below. Spectrum clarified with the VFA that the Otway Deep MSS does not include any activities that could result in "impacts form drilling muds and cuttings disposal" or " the installation of any infrastructure such as pipelines". Spectrum clarified that should any venture in the future be considering further developments based on the results of this survey, they would be required to undertake all approvals under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 which will include a stakeholder consultation component. Effects of seismic: the impacts on fish species within the survey area as a consequence of seismic activity are mainly expected to be behavioural. These are likely to be temporary as the seismic vessel transverses each survey line, localised in spatial extent, and most relevant to continental slope habitat which comprises only a small part of the overall survey area. Behavioural responses are more likely to result in changes in diel movements (vertical) rather than horizontal movements, and it is unlikely that fish will be displaced from the survey are, particularly give the area will not be permanently ensonified for the whole duration of the survey. This is because the survey vessel will transverse sail lines starting inshore and moving offshore, with each subsequent sail line being between 8 and 12km away from the preceding line. Fish exposed to received sound levels eliciting a behavioural response will therefore recover between sail lines Proposed control measures to minimise disruption to fisheries: Proposed control measures to minimise disruption to fisheries through exclusion zones include reductions in the survey plans to avoid where possible overlap with key habitats along the continental slope.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					In addition, the following management measures are proposed to avoid long-term (> 1 month) displacement of fishers and avoid potential conflict with fishing activities or loss of fishing equipment Spectrum will notify all relevant persons 4 weeks prior to the start of the survey of the survey details including timing, location and duration Fishers actively operating in the survey area will be issues a 7 to 10 day forecast prior to activities commencing in the survey area, and will be kept informed of daily survey activities through Spectrum's 24-hour look-ahead communication process. Spectrum will continue to advise relevant fishers of planned sail-lines and dates and if any issues are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflicts. Controls to be considered will include: Moving to another sail line Deviating around fishing activity area by 3km Allowing fishers to fish area prior to seismic acquisition Minimise survey activity areas where there is known fishing activity Long-term displacement of fishers will be avoided by ensuring that each cluster of surveys ('racetrack') is completed within one month A support vessel will accompany the survey vessel and manage interactions with other marine users' vessels transiting near the seismic vessel or streamers. VFA is considered a relevant stakeholder and will continue to receive updates regarding the proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to VFA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Fisheries associations					
Commonwealth Fisheries Association (CFA) [redacted]	09/02/18 29/03/18 05/04/18 05/04/18	1st formal notification 1A General Phone call outgoing (FLO) Email outgoing Email incoming	No feedback received in response to the first stakeholder consultation letter. Via email 05/04/18: CFA acknowledged receipt of the information sent and indicated they would need time to review the information following the meeting.	The CFA have requested time to review the information provided on 05/04/18. The CFA's request to review information provided to stakeholders prior to meeting with Spectrum is merited. Action: Spectrum to allow sufficient time for the CFA to review the materials and provide a response if they decide to. To date, no response has been received about the materials provided on 05/04/18. Sufficient time has been provided. No further action.	Via phone call 29/03/18: Spectrum phoned the CFA to notify them of the FLO's appointment to the Spectrum Otway Deep MSS and discussed time and location for a meeting. Via email 05/04/18: Spectrum provided the CFA with materials for discussion during the meeting (05//04/18) including: a copy of the draft underwater sound modelling report prepared by JASCO information on consultation, notifications and control measures being considered to limit potential impacts on fishers and fisheries high resolution maps of three indicative areas of interest illustrated by survey turn lines within the proposed acquisition area. Spectrum also advised that the EP impact assessment was under development and that the outcomes of the meeting would feed into the impact assessment (conclusions on the level of impact, control measures and in determining whether impacts are considered acceptable).
	05/04/18	Meeting (minutes in Appendix G)	Meeting held between Spectrum, the FLO, CFA and SIV on 05/04/18 at SIV's Melbourne office: The CFA requested that Spectrum meet with representatives from various fisheries sectors. Advised that so long as Spectrum consults fisheries representatives, the CFA would not have issue with the survey.	No new objections or claims, however CFA have requested consultation with fisheries representatives. The CFA's request for consultation with relevant fisheries is merited due to potential for Commonwealth Fisheries to be impacted by the survey. Action: Spectrum to ensure that fisheries representatives are consulted with.	During the meeting on 05/04/18 at SIV's Melbourne office the CFA and SIV were informed that Spectrum would apply for two acquisition seasons over the next two years (with the acquisition season being 120 days annually between start October and end February) within the three indicative areas of interest. Spectrum further discussed the survey area and underwater noise modelling by service providers JASCO for both single and cumulative shots with respect to various locations. Representatives of the various fisheries sectors (including license holders and peak bodies) have been engaged as relevant and are included in this table.
	01/06/18	2nd formal notification 2C Fisheries	No feedback or response received in response to the 2nd formal notification sent to CFA on 1st June 2018.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	01/02/19	3rd formal notification 3A General	No feedback or response has been received in response to the 3rd formal notification sent to CFA on 1st February 2019.	No feedback or response provided. Reasonable opportunity has been given for a response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to CFA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Crustacean Fisheries Advisory Committee (CFAC)	29/03/18 11/05/18 01/06/18	1st formal notification 1A General	Via phone call incoming 11/05/18:	CFAC claims that the last seismic survey left the crab fishery quiet for five years. Also has concerns about loss of income and impacts to future crab stocks. These claims are merited.	Via email outgoing 29/03/18:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted]	01/08/18	Phone call incoming (FLO) 2nd formal notification 2C Fisheries Phone call outgoing (FLO)	Stakeholder advised FLO of concerns about the impacts of seismic surveys and claimed the last survey left the fishery quiet for five years. Stated concerns about income certainty and potential for renumeration for not fishing in the year of the survey. Also concerned about impacts to future stocks. Via phone call outgoing 01/08/18: CFAC stated the trimmed areas of the survey reduce some part of CFAC's concern but the stakeholder still feared long-term damage to the crab stock and financial loss.	CFAC's concerns regarding the impacts of seismic surveys and concerns over loss of impact are merited due to potential for Commonwealth Fisheries to be impacted by the survey. Action: Spectrum to consider the claim about the 2010 seismic survey impacting the crab fishery, and the concerns about future impacts to stocks and loss of income.	FLO sent the first stakeholder consultation letter and spatial maps to CFAC representative, asked for their feedback and noted the meeting with Spectrum scheduled for 05/04/18 if they wished to attend. Via phone call incoming 11/05/18: In response to the phone call from CFAC, the FLO stated he would provide the feedback to Spectrum. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter – fisheries. This consultation letter contains a summary of the potential impacts of seismic sound on crustaceans, including giant crabs and the control measures adopted by Spectrum. The impact assessment considers the short- and long-term impacts of the seismic survey on fisheries. The letter also included a control measure for compensation of fishers for equipment that is damaged beyond repair by the survey. Spectrum did consider other compensation options and they were not adopted. This assessment is in this EP. Spectrum also considered the location and timing of the survey in relation to giant crab areas and following further consultation with crab fishers and has responded to concerns by moving the south-eastern boundary of the survey area further offshore outside giant crab biological depth range. Via phone call outgoing 01/08/18: FLO contacted CFAC to get feedback on the trimmed survey boundary.
	01/02/19	3rd Formal Notification 3A General	No feedback or response has been received in response to the 3rd formal notification sent to CFAC on 1st February 2019.	No feedback or response provided. Reasonable opportunity has been given for a response. No action required.	This stakeholder is considered relevant and will continue to receive project updates from Spectrum.
	18/03/19	Email outgoing	No response has been received in response to the email outgoing sent to CFAC on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to CFAC's feedback (once received) to the email sent 18/03/19 in ongoing consultation	Via email outgoing 18/03/19: In response to CFACs concerns regarding the negative impacts associated with seismic surveys, CFAC's comments regarding seeing the fishery go quiet for 5 years after a seismic survey came through the area, concerns over income certainty and potential remuneration for not fishing the year of the survey and concerns regarding the impacts to future stocks. Spectrum responded to CFAC's concerns on the 14th March 2019, the response highlighting impacts of seismic on plankton and spawning and impacts to giant crab and rock lobster. The change in the survey area (trimming southern area off shelf edge) to avoid overlap with habitat fished by Tasmanian giant crab fishers, also means no sound will impact adult stock since the available information shows that these are also limited to depths of 400m. Regarding plankton (potentially including crab larvae), in general, there have been few studies into the effects of marine seismic surveys on plankton. Up until recently, studies on the effects of noise from airguns on plankton have indicated that any effect is likely to be highly localised (<10m from the source and typically within 0.5 to 5m) these studies indicate the impacts would be insignificant compared to the naturally high turnover rates of zooplankton. Research conducted by Day et al. (2016) exposed egg-bearing female spiny lobsters (*Jasus edwardsii*) to noise from three air gun configurations, all of which exceeded levels of 209 dB re 1 μPa (Lpk-pk). Overall there were no differences in the quantity or quality of hatched larvae, indicating that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure. The potential impacts of the Otway Deep MSS on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the gun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to the diel migration of plankton (including fish lavae) between surface and deep waters. Consequently, predicting impacts is difficult due to not only the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey. Based on the underwater sound modelling for the Otway Deep MSS, the predicted ensonified area within which received sounds levels exceed popper et al.'s (2014) mortality or mortal injury threshold for fish eggs and larvae is restricted to a distance of 110m from the source through the water column and 166m from the source at the

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					seabed. In consideration of the spatial and temporal extent of this predicted impact it is also important to consider the following: Any plankton, including fish eggs and larvae, present in the water column within the survey area will not be evenly distributed, and are likely to exhibit substantial spatial patchiness and will be moving with the currents in the area; The seismic source will be constantly moving, and plankton populations' are constantly being replenished by currents from non-impacted areas. Plankton populations' recover quickly due to their fast growth rates, and the dispersal and mixing of plankton from both inside and outside of the impacted area. Any mortality or mortal injury effects to fish eggs and larvae resulting from seismic noise emissions re likely to be inconsequential compared to natural mortality rates of fish eggs and larvae, which are very high (exceeding 50% per day in some species and commonly exceeding 10% per day). From this assessment, predicted impacts are localised (within the 110-160 m from the sound source), and short term based on estimated recover times (days). These potential impacts are not significant when compared to rates of natural mortality in planktonic populations (10-50% per day), and impacts are not expected at a regional scale, based on the survey area plus 116m buffer comprising 0.56% of the South-east Marine Bioregion. Therefore, no long-term impact to CFAC's catch of giant crab is expected. CFAC is considered a relevant person and will continue to receive updates from Spectrum regarding the proposed Otway Deep MSS.
	Ongoing consultation: Spectrum will continue to provide project updates to CFAC and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.				
Great Australian Bight Industry Association (GABIA) [redacted]	27/02/18 01/06/18 11/06/18 01/02/19	1st formal notification 1A General 2nd formal notification 2C Fisheries 2nd formal notification 2A General 3rd Formal notification 3A General	No feedback received in response to the 1st, 2nd, 2nd and 3rd formal notifications sent to GABIA on the 27th February 1st and 11th June 2018 and 1st February 2019 respectively.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	07/03/19 07/03/19 08/03/19	Phone call outgoing Email outgoing Email incoming	Via phone call outgoing 07/03/19: GABIA stated they had received the updates and thought that there is minimal impact on those in the bight however requested to continue to be kept informed with updates on the proposed survey. Via email incoming 08/03/19: GABIA confirmed Spectrum's documentation of the phone call was correct.	Request from GABIA to be kept updated is merited due to potential for survey to impact the Great Australian Bight. Action Spectrum to continue to send updates to GABIA regarding the proposed survey.	Via phone call outgoing 07/03/19: Spectrum contacted GABIA to ensure they had been receiving the consultation updates that had been distributed to the. Via email outgoing 07/03/19: Spectrum followed up phone call with GABIA representative to ensure no comments were missed. Spectrum noted that the GABIA representative stated that there are no concerns at this point and that there would be a minimal effect on those in the bight, however GABIA would like to be kept updated on the progress of the survey. GABIA is considered a relevant stakeholder and as per their request, will continue to receive updates regarding the proposed Otway Deep MSS.
	Ongoing consultation: Spectrum will continue to provide project updates to GABIA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.				
Marine Fishers Association Inc (MFA) (South Australia) [redacted]	27/02/18 11/06/18 21/06/18 21/06/18 21/06/18	1st formal notification 1A General 2nd formal notification 2C Fisheries Phone call outgoing Email outgoing Email incoming	No feedback received in response to the first or second stakeholder consultation letters. Via phone call outgoing 21/06/18: Spectrum phoned MFA to ask if they could provide his association members with information regarding the proposal and if he had any information he may have on where his association members are fishing that could help reduce the impacts of the seismic survey. [redacted] directed Spectrum to a SARDI fisheries status report. Via email incoming 21/06/18: MFA replied stated that the MSF is predominately a nearshore fishery, with some notable exceptions (e.g. Jacket Trap Fishers) and that he would need to consult the area before he could recommend the best course of action.	No objections or claims.	Via email outgoing 21/06/18: Spectrum followed up phone call with an email stating that the SARDI fisheries status report has been used to assess scalefish fishing effort in the area, but that Spectrum was more specifically seeking feedback on from SA Marine scalefish licence holders on their proposal, particularly if there are any concerns about potential impacts on their activities.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	29/06/18 02/07/18	Email incoming Email outgoing	Via email incoming 29/06/18: MFA advised that there is no significant marine scalefish fishing activity in the region that would prompt concerns of interaction with the survey vessel and fishing gear. He noted they shared the growing industry concerns regarding the cryptic impacts that marine seismic surveys may have on the larval stages of target species.	MFA stated they shared the concerns of industry about seismic impacts on the larval stages of target species. The MFA's concerns regarding the impacts of seismic surveys on the larval stages of target commercial species is merited due to their role as a representative for Scalefish Fishery license holders. Action: Spectrum to respond to concerns raised in email received on 29/08/18	Via email outgoing 02/07/18: Spectrum replied to MFA thanking them for the advice that minimal fishing activity by operators in the SA marine scalefish fishery occurs in the vicinity of the proposed Otway Deep Marine Seismic Survey. This aligns with data published by SARDI demonstrating no fishing effort by this sector since 2001 in fishing blocks directly impacted by seismic activities (Blocks 56 and 58). Spectrum acknowledged the MFA's concern about the potential impacts of seismic activity on larval stages of target species and stated that it had been raised elsewhere and is a focus of the impact assessment. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd Formal notification 3A General	No feedback provided in response to the 3rd formal notification sent to the MFA on the 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	14/03/19	Email outgoing	No response has been received in response to the email outgoing sent to the MFA on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to MFA's feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19: In response to MFA's comments regarding the industry's growing concerns regarding the cryptic impacts on the larval stages of target species, Spectrum provided MFA with a summary of the impact assessment relating to impacts on plankton (incl, fish larvae and eggs) and spawning, and impacts to spawning. Impacts to plankton (incl. fish larvae and eggs) and spawning The potential impacts of seismic surveys on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the airgun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to diel migration of plankton (including fish larvae) between surface and deep waters. Consequently, predicting impacts is difficult due not only to the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey. Although the recent work by McCauley et al. (2017) and Richardson et al. (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. Impacts to spawning The potential mortality of larval fish that rely on zooplankton for food is difficult to predict but is not expected to affect a significant proportion of larvae based on the assumption that not all zooplankton are killed by exposure to airguns (around 22% to 35%, depending on ocean circulation; Richardson et al. 2017), only a very small proportion of the plankton would be exposed at any one time, and that zooplankton populations are likely to begin to recover rapidly following completion of a seismic survey due to fast growth rates, combined with dispersal and mixing of zooplankton from both within and without the area of effect. Richardson et al. (2017) showed that zooplankton communities can begin to recover during the survey period during periods of good oceanic circulation (and periods of upwelling), and therefore a continuous decline is zooplankton throughout the survey period is not anticipated and parts of the survey are would progressively recover during the survey. It is unlikely there would be localised patches of reduced food availability for plankton feeders over the period of the survey and during the 3-day recovery period (as modelled by Richardson et al. (2017)). No population level effects are expected in commercially caught finfish species, or to their catch rates as an indirect result of impacts on eggs/larvae. Based on the results of the modelling and research thresholds, impacts to these species, particularly at the population level, is expected to be negligible. A control is in place on survey operations to avoid surveying waters shallower than 500 m depth after the start of December to reduce impacts on spawning.
		Ongoing consultation: Spectrum will continue to provide project updates to MFA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
Port Campbell Professional Fishermen's Association (PCPFA)	09/02/18 01/06/18 01/02/19	1st formal notification 1A General 2nd formal notification 2C Fisheries 3rd Formal notification 3A General	No feedback or response has been received in response to the 1st, 2nd and 3rd formal notifications sent to PCPFA on the 9th February and 1st June 2018, and 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to PCPFA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Seafood Industry Australia (SIA) [redacted]	03/04/18 05/04/18 06/04/18	1st formal notification 1A General Email outgoing (FLO) Email outgoing (FLO)	No feedback received in response to the first stakeholder consultation letter.	No feedback has been provided by SIA provided. Reasonable opportunity has been given for response. No action required.	Via email outgoing 03/04/18: FLO contacted SIA to invite them to meetings Spectrum were planning in Melbourne and Hobart, possibly in mid-April. Stated they would send a follow-up email with some materials for reading prior to the meeting. Email outgoing 05/04/18: FLO followed up and sent SIA high-resolution maps and a copy of the noise modelling report. Via email on 06/04/18: FLO enquired about [redacted] to meet in Melbourne on the 13/4/18 following a 12/4/18 meeting with TSIC. No reply. No feedback has been received from SIA regarding the consultation materials provided to them.
	08/03/19 08/03/19	3rd formal notification Email incoming	Via email incoming 08/03/19: Automated response from SIA stating SIA representative is currently on leave and will e back on the 12th March. No feedback has been provided regarding the 3rd formal notification sent to SIA on the 8th March 2019.	No feedback has been provided by SIA, reasonable opportunity has been given for a response. No action required.	Spectrum considers SIA a relevant stakeholder and will continue to send updates regarding the proposed seismic survey through to them.
		Ongoing consultation: Spectrum will continue to provide project updates to SIA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Seafood Industry Victoria (SIV) [redacted]	09/02/18 28/03/18 29/03/18 29/03/18 29/03/18 29/03/18 05/04/18 05/04/18 05/04/18	1st formal notification 1A General Phone call outgoing Email outgoing Email outgoing Email incoming Email outgoing Email outgoing Email outgoing	No feedback received in response to the first stakeholder consultation letter. Via email 29/03/18: In response to the meeting confirmation, SIV replied requesting the following: Spectrum's consultation plan and how they intend on consulting the potentially affected commercial fishers in Victoria. Noted they could assist but did not have the funding to do so. Noted the interests of their members rely on a healthy marine environment, not just their target species so would require the EP to consider the broader ecosystem not just target species Provide information prior to the meeting: copy of the sound modelling, not just a summary the sections of the EP that relate to potential impacts of the seismic survey, including information on risk assessment tables used and any additional information considered in addressing risks from the survey to marine life. SIV also asked that Spectrum not submit the EP until they had had reasonable time to consider the above information and provided feedback.	SIV have requested further information on the proposal and potential impacts. SIV also requested that Spectrum provide sufficient time to provide feedback on materials. SIV's request for additional information to review prior to meeting with Spectrum is merited due to potential for survey to impact stakeholders represented by SIV. Action: Spectrum to provide the information requested by SIV and allow sufficient time for a response.	Via phone call 28/03/18: Spectrum phoned SIV to notify them of the FLO's appointment to the Spectrum Otway Deep MSS and discussed time and location for a meeting. Via emails 29/03/18: Emails confirming details of meeting planned for 05/04/18. Spectrum also confirmed that further documentation including noise modelling and impact assessments had recently been completed and would be sent out soon. Via emails 05/04/18: Spectrum provided SIV with the requested materials for discussion during the meeting (05//04/18) including: Spectrum's consultation plan and how they intend on consulting the potentially affected commercial fishers including a notification schedule Control measures being considered to limit potential impacts on fishers and fisheries, as well as the broader ecosystem Copies of: The draft underwater sound modelling report prepared by JASCO Control measures being considered to limit potential impacts on fishers and fisheries, as well as the broader ecosystem High resolution maps of three indicative areas of interest illustrated by survey turn lines within the proposed acquisition area. Spectrum also advised that the EP impact assessment was under development and that the outcomes of the meeting would feed into the impact assessment (conclusions on the level of impact, control measures and in determining whether impacts are considered acceptable). Sufficient time has been provided for review and feedback on the materials sent on 05/04/18. Subsequent consultation with SIV is in the rows below.
	05/04/18	Meeting (minutes available in Appendix G)	Meeting held between Spectrum, the FLO, CFA and SIV at SIV's Melbourne office on 05/04/18: SIV raised the following during the meeting:	Additional claims were made related to the following: measurement of cumulative noise request for maps showing spatial extent of noise	Responses to claims made by SIV during the meeting (05/04/18): Measurement of cumulative noise: In the meeting, Spectrum noted they had not seen the report but that it would be reviewed and incorporated into the EP impact assessment.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			explained privacy law forbids the VFA and SIV issuing contact information for license holders but that they can provide fee for service circulation of information to license holders and the VFA is developing a fee for service schedule to address Oil and Gas industry requests queried the draft noise modelling report stating that a recent Northern Territory Seafood Council (NTSC) letter to NOPSEMA had proposed that measuring cumulative noise over a 24-hour period (as per industry standard) is inadequate and should be measured over 5 days requested maps that illustrate the spatial extent of seismic noise over the survey area noted that Origin Energy had contributed $100,000 towards rehabilitation of lobster stocks following the Crowesfoot Survey in response to the FLO's comment that the fishery targeted rock lobsters in waters depths <55 m, SIV noted that the existence of lobster stocks in deeper waters was important in a whole of stock sense questioned whether the airguns would be turned off during turns and noted that they were satisfied with Spectrum's commitment that soft-start procedures and ramping up of the airguns would only take place within the survey area stated that most fisheries key species spawning period ends between October and February and indicated that this may concern stakeholders expressed concerns that previous seismic surveys showed that actual recorded noise levels were far higher than modelled. SIV mentioned that the CarbonNet results should be out soon and it would be interesting to see how closely the results would be to the modelled numbers expressed concern over the impact to trawlers from concrete ballasts left behind following recovery of the OBNs. inquired about interaction between Spectrum's proposed survey and that of 3D Oil in their adjoining lease, and highlighted concerns about cumulative impact on the sole operator in the Victorian Giant Crab fishery.	that impacts to lobsters even in deeper waters could impact the overall stock that stakeholders would be concerned with overlap of the survey with spawning periods of key species that actual noise levels for previous seismic surveys were higher than that modelled that concrete ballasts could interfere with trawlers. that there would be cumulative impacts with other surveys SIV's claims above are each merited. Action: Spectrum to respond to each of the claims listed above and incorporate into the impact assessment for the EP as appropriate.	Spectrum subsequently responded to SIV formally (refer to consultation event dated 03/08/18) explaining the NTSC letter to NOPSEMA and that it did not align with the findings of the CMST report they commissioned. Request for maps: Spectrum referred SIV to the draft noise modelling report maps showing the spatial extent of the worst-case noise footprint from the survey and provided a summary of the draft results and implications for fish, invertebrates and spawning (plankton). Impacts to rock lobsters: Spectrum showed SIV a figure produced from catch data for the Victorian Rock Lobster Fishery for 2012-2017 provided by the VFA aggregated by operators and years, and noted that few, if any, licence holders had been active in the operational area. The data had a quadrat granularity of 10 minutes of a degree (cells ~18 km^2) so appeared to show activity may occur in the vicinity of the survey area along the continental shelf but the FLO advised that the fishers targeted rock lobsters in water depths <55 m. In response to SIV's comment that the existence of lobster stocks in deeper waters was important in a whole of stock sense, the FLO noted that the deeper boundary of lobster stocks was defined by a natural boundary the mud line at around 140 m, which limited the rocky habitats required by lobster. Seismic acquisition will only occur within the survey area boundary (i.e. at depths >170 m) with soft-start procedures and ramping up of the airgun included as controls to limit potential impacts to lobster stocks present at depths ~140 m. Survey timing with spawning periods: Spectrum advised that the EP would consider control measures for avoidance of spawning events. Control measures have since been included in the EP to minimise the potential impacts of the proposed survey on fish spawning. A control is in place on survey operations to avoid surveying waters shallower than 500 m depth after the start of December to reduce impacts on spawning. The commercially important fish species that occur within the oil spill EMBA are largely broadcast spawners, with several species forming spawning aggregations on the continental shelf, shelf break and slope. Significant spawning aggregation areas are not known to occur in the vicinity of the survey area, although information regarding fish spawning in offshore regions of the Otway Basin is generally not well documented (Table 4.6 in the EP) Richardson *et al.* (2017) showed that zooplankton communities can begin to recover during the survey period during periods of good oceanic circulation (and periods of upwelling). Hence, a continuous decline in zooplankton throughout the survey period is not anticipated, and parts of the survey area would progressively recover as the survey proceeded. It is unlikely therefore that localised patches of reduced food availability for plankton feeders would occur over the period of the survey and during the 3-day recovery period (as modelled by Richardson *et al.* (2017)). No population level effects are therefore expected in commercially caught species, or to their catch rates as an indirect result of impacts on eggs/larvae. Consultation with State fisheries authorities (including VFA, PIRSA and the Tasmanian Seafood Council) and commercial fishing associations for fisheries permitted to operate in the survey area identified concerns over potential impacts to commercially important species spawning within the survey area during the proposed Otway Deep survey window. Spawning periods for key species of Commonwealth and State managed fisheries with a jurisdictional area that includes the survey area are Table 4.6 within the EP. Note Table 4.6 does not include information for key species of fisheries that overlap with the survey area but which only occur at depths shallower than the minimum depth of the survey area (i.e. at depths <170 m, such as scallops), species able to be fished in the survey area do not spawn within the south-east marine region (such as tuna, billfish, gemfish west, John dory and mirror dory) or during the proposed survey window (such as blue warehou, sawshark and ribaldo). The spread of fish spawning periods throughout the year indicates that there are specific periods of higher sensitivity with respect to fish spawning for key fisheries species that may spawn within the Oil Spill EMBA during the proposed survey window with these predominantly occurring during late-spring Modelled noise versus actual seismic noise: In response to SIVs concern that recorded noise levels were far higher than modelled, Spectrum reiterated that the modelling

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					carried out by JASCO was based on worst case scenarios for propagation of sound. Spectrum also referred to JASCO's model showing close correlation between actual and modelled results for other surveys they have modelled. Spectrum noted that the OBN component of the Otway Deep MSS is implemented then Spectrum would use the OBNs to monitor actual recorded noise levels and ensure that received sound levels were not higher than modelled. CarbonNet have been contacted for the results of the verification study, however they are unable to provide them for commercial reasons. If the CarbonNet results become publicly available, then these will be reviewed to determine implications for the Otway Deep EP. It is noted that the PGS have detailed in the publicly available Duntroon seismic survey EP the results of a verification study they undertook in New Zealand waters. They noted that in field verification showed received levels being lower than predicted in the sound modelling (PGS Duntroon Seismic Survey, 2018). Since the acoustic modelling undertaken for this EP by JASCO has used conservative assumptions for model inputs, the verification to be undertaken for this survey is expected to show results similar to the model prediction. Interference of concrete ballasts with trawlers: Spectrum advised that the OBNs would only be placed on non-trawled areas (and this has been adopted as a control measure) noting that efforts to seek details of fishing locations were ongoing. Advice from the FLO suggests that ground rope of a trawler would not be impacted by the concrete ballast which is expected to have dimensions of approx. 150 mm wide x 630 mm long and be similar to rocky substrate typically encountered by trawl nets. Cumulative impacts: Spectrum confirmed that the Otway Deep MSS seismic vessel would maintain a separation distance of 40 km from the 3D Oil seismic vessel (if the surveys were to operate concurrently). Spectrum also committed to providing a summary of the impact assessment outcomes (noise and physical interaction) in the second stakeholder consultation letter. This was sent to SIV on 01/06/18.
	11/04/18 01/06/18 05/06/18 06/06/18 08/06/18 08/06/18	Phone call outgoing 2nd formal notification 2E SIV/TSIC Email incoming Email incoming Email outgoing Email incoming	Via phone call 11/04/18: In response to Spectrum's phone call to discuss the dissemination of information to fishers, [redacted] said SIV was happy to distribute information to license holders on a fee for service basis. Via email 05/06/18: In response to the second stakeholder consultation letter, SIV provided Spectrum with a final version of the SIV consultation framework and requested Spectrum adopt it and provide feedback on it. SIV stated they did not have the time or resources to review the consultation letter given its size. They stated they would contact NOPSEMA since Spectrum had not adequately consulted with industry on the risks in the EP. Via email 06/06/18: SIV stated there was no support from industry for the proposal to continue. Expressed dissatisfaction with the consultation undertaken by Spectrum and the submission of the EP on 8 May 2018. They noted their concerns have been raised directly with NOPSEMA, and expressed a desire for more frequent updates of project progress and notification prior to EP submission. Via email 08/0618: Autogenerated reply that the contact person was out of the office.	SIV provided their consultation framework and claimed that Spectrum's consultation with the fishing industry was inadequate and objected to the survey proceeding. SIV's concerns regarding the consultation undertaken to date are merited. Action: Spectrum to review the SIV consultation framework and if appropriate incorporate into their consultation process and continue to consult with SIV.	Via phone call 11/04/18: In response to [redacted] offer, the FLO explained that very few fished the area and Spectrum were in touch with them. [redacted] acknowledged that, but that all license holders should know about the survey. The FLO said he would pass on the offer to Spectrum. Via email 01/06/18: Spectrum provided the second stakeholder consultation letter to SIV. Via email 08/06/18: Spectrum replied to SIV's emails on 05/06/18 and 06/06/18 thanking SIV for their ongoing engagement and frank feedback. Spectrum recognised the potential for conflict between industries operating in the same waters and expressed their committed to minimising and mitigating impacts from their activities on other users, including fishers and the fish stocks they rely on. Noted that Spectrum were drafting detailed responses to SIVs concerns and identifying how they could consult more effectively.
SIV (continued)	21/06/18 21/06/18 04/07/18 10/07/18 10/07/18 10/07/18 10/07/18	Phone call outgoing Phone call incoming Email outgoing Email incoming Email outgoing Email incoming Email outgoing	Via phone call 21/06/18: Spectrum phoned SIV to request a copy of the new policy that SIV and TSIC had been jointly developing. Via emails (x2) 10/07/18: SIV replied and provided a copy of their proposal. SIV agreed to a phone call the following day.	Spectrum and SIV are discussing a proposal for consultation services.	Via phone call 21/06/18: Spectrum phoned SIV to request a copy of the policy that SIV and TSIC had been jointly developing. Via email 04/07/18: Spectrum requested a copy of SIVs proposal for their consultation services prior to meeting mid-July. Via emails (x2) 10/07/18: Spectrum thanked SIV for the proposal and arranged a phone call with SIV the following day to discuss the consultation required under the proposal.

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	11/07/18 11/07/18 12/07/18	Phone call outgoing Email incoming Email outgoing	Via email 11/07/18: SIV followed up phone call stating the following: the most appropriate way forward immediately is to put a note of information out to our 600 odd contacts who are involved in the Victorian fishing industry Spectrum's timeframe was tight and although information could be sent to stakeholders within a couple of days, that would still only leave them with days to respond. Stated there would need to be some caveat around ensuring there is continued consultation by Spectrum through the future process The follow-on level of interest from the industry is unknown. They recommended a funded distribution of the information through SIV, followed by a compilation of comments from industry and then further meetings and engagement from there.	SIV made recommendations on the way forward for consultation with Victorian fishers. SIV's suggestions for ongoing consultation with fishers is merited. Action: Spectrum to review SIVs recommendations and proposal and respond to SIV.	Via email 12/07/18: Spectrum thanked SIV for the feedback and requested some additional inclusions in the proposal: A review of existing consultation already undertaken by Spectrum to identify any gaps Provide a list of stakeholders they will be contacting, at a fishery level, and Provide stakeholder feedback by 20/07/18 Spectrum stated they would then meet with SIV's members face to face following the 20/07/18. Spectrum accepted SIV proposal to consult with fisheries stakeholders on their behalf.
	25/07/18 25/07/18 25/07/18 26/07/18 03/08/18 03/08/18	Email incoming Email outgoing Email incoming Email outgoing Email outgoing Phone call outgoing	Via email 25/07/18: SIV provided Spectrum with their draft report (compilation of issues raised). The draft report is provided in Appendix J of this EP. The following key concerns were raised in the report: stated that any action that could reduce viability in one sector of the industry (rock lobster fishery) has a knock on effect in other sectors since fishing effort is not reduced (fishers more from area to area if excluded from one area), and that this has the potential to increase the number of potentially impacted people in the fishing industry. concern that any disruption of the migration, spawning or larval life cycle while suspended in the water column has every possibility of significantly impacting recruitment and settlement into a fishery rock lobster: concerns about lack of scientific certainty on impacts to rock lobster and that the activity will span two peak rock lobster seasons squid: serious concerns on the impact of seismic testing on squid migratory patterns, reproductive organs and squid eggs, and the proven impact of seismic on plankton, which is a major food source for squid given there is currently no known safe range for fish resources from seismic operations SIV requested an independent review of the impact buffer concerns that fishers rights are displaced by this survey, reducing their economic opportunities (particularly western zone rock lobster) noted some fishers who had not met with Spectrum would appreciate the opportunity to do so. Report stated that to meet ALARP in the eyes of Victorian rock lobster fishers, Spectrum must: remove all potential rock lobster habitat (<150m) from survey area expect negotiations to begin to discuss compensation/quota retirement for displaced fishers consider opportunities for funding re-seeding programs for rock lobster - given the scientific uncertainty of the long-term impact an appropriate precautionary mitigation would be to make contribution to the upcoming rock lobster reef re-seeding program which seeks to assist in restoring the marine environment following the damage done by seismic air-guns. To meet ALARP in the eyes of Victorian giant crab fishers, Spectrum must: extract giant crab habitat from the survey engage in compensation/quota retirement for displaced fishers. There were multiple queries in the report regarding literature, control measures, consultation process, etc and ten actions assigned to Spectrum as "next steps". Spectrum Geo to consider the information provided by industry (via SIV) and respond in due course.	Claims were made that the seismic survey would displace fishers (which would have knock-on effects to other sectors), that the survey would affect fishers economically, that seismic sound would impact species (particularly rock lobsters, squid and giant crab) and their food chain and habitat, and there was concern that any disruption to the migration, spawning or larval life cycle would affect recruitment further impacting a fishery. SIV requested an independent review of the impact buffer proposed for the survey. SIV also noted that several fishers were interested in meeting with Spectrum. SIV's claims that the seismic survey would displace fishers (which would have knock-on effects to other sectors), that the survey would affect fishers economically, that seismic sound would impact species (particularly rock lobsters, squid and giant crab) and their food chain and habitat, and there was concern that any disruption to the migration, spawning or larval life cycle would affect recruitment further impacting a fishery are merited. Action: Spectrum to review SIVs draft report and provide a formal response to SIV to each query and concern raised in their report. Action: Spectrum to contact SIV to arrange a face to face meeting with fishers.	Via email 25/07/18: Spectrum acknowledged SIV's draft report had been received and that they would provide responses. Spectrum requested SIV's help in distributing this response to their members once it was formulated. Spectrum also requested a list of which stakeholders had provided the feedback and the areas they have fished (or depth ranges if they cannot provide areas). Via email 26/07/18: In response to SIVs email, Spectrum stated they would not be putting personal details/information in the EP, and the reason for the request is to identify who missed the original consultation. Spectrum also requested SIV confirm they had reached out to all members (the 492 that was mentioned in the report). Spectrum also requested additional information (e.g. the number of license holders per fishery that have been contacted) be included in the final report. Spectrum stated they were working on a response to the report, but that it is difficult to address some comments (e.g. blue eye trevalla/giant crab have been caught in the area, but no spatial information has been provided, nor who the fishers are, depth ranges/seasons they fish in, etc.). Via email 03/08/18: Spectrum thanked SIV for the draft report and attached their response (provided in Appendix J of this EP). Spectrum responded to each query and concern raised in the report. Further information on the loss of access to fishing grounds and interference with fishing gear, seismic noise impacts on adult fisheries species and larvae, and the control measures in place to reduce impacts, was included in Spectrum's response for SIV to forward to their members. Spectrum addressed concerns that knock-on fishing effort may mean that there are potentially impacted people which have not been contacted by explaining that they have contacted and consulted with all fishers they have thus far been identified as potentially impacted. Discussion regarding displacement of fishers and associated measures by Spectrum to minimise this displacement was provided. Spectrum further appreciates the concerns raised regarding the 'knock-on effect' but is confident that disruption to fishing activities will be manageable by all parties, and not lead to this impact. Spectrum commenced the consultation process in February 2018. Since that time the consultation process has been ongoing and broadening in scope as new stakeholders are identified and their contact details obtained (often via lengthy processes). To assist with identification and consultation of fishing industry stakeholders a Fisheries Liaison Officer and a Fisheries Consultant (both Victorian based) with existing relationships with many fishers were contracted early in this process. Spectrum appreciates the fact that various fishers contacted by SIV had already received information about the proposed survey and have met individually with Spectrum representatives to provide feedback. Spectrum notes that SIV has identified some entities who may not have had opportunity to provide feedback on the proposed surveys. This is quite possible because of the complex and fluid working relationship that sometime occurs between license holder, quota allotment and fishers. As such, Spectrum is keen to continue liaising with SIV whilst noting its belief that it has made all reasonable effort and has adequately liaised with all relevant license holders and fishers.

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			Apollo Bay meeting with Rock Lobster and Giant Crab fishers to discuss in more detail. Spectrum Geo to commission sound reach maps for consideration by industry and how these will be complied with or measured (similar to those provided above for Crowes Foot Survey). An independent review should be undertaken to assess and advise on 'sound buffer' to achieve a definite limit of sound exposure. Spectrum Geo to provide SIV for distribution to industry maps of the seismic survey, fishing grids and the outermost area of seismic sound exposure to be overlaid on the map. Spectrum Geo to consider options for working with industry in a pre/post survey assessment which will contribute scientifically to the knowledge of interaction of seismic operations with fisheries resources. Spectrum Geo to enter negotiations with SIV identified 'potentially affected' persons regarding potential compensation. Spectrum Geo to provide SIV with their sections in the EP which address concerns raised in this report, and allow an opportunity to comment. Spectrum Geo to provide SIV and industry with their section of the EP which considers 'cumulative impact' and assesses previous exposure to seismic operations in the region. Including a map that assesses and identifies any overlap of seismic surveys since 2015 to ascertain the Rock Lobster biomass impacted. Noting: from settlement on the reef it is estimated that it takes 5-7 years to be of legal size. Spectrum Geo to work with SIV on opportunities for fisheries 're-seeding' work, in particular the work being undertaken for Rock Lobster at present. Via email 25/07/18: In response to Spectrum's request for details of the licence holders that provided comment and the areas/depths they fished, SIV stated they would check with the stakeholders but prefer this not occur.		In regard to potential impacts on the rock lobster fishery, a review of impacts by seismic activities on rock lobster and planktonic larvae was provided below in Appendix 1 of the response, along with associated controls to manage these impacts. The concerns are noted and mirror general concerns previously voiced by fishers over the potential impacts of seismic activities on adult and planktonic stages. Based on a review of available information Spectrum notes that it is likely that some of these species may spawn within the Activity EMBA during the survey period. However as described in Appendix 2 the spatial extent of spawning by these species is broad and the intermixing of eggs and larvae due to planktonic drift is expected to minimise any localised and short-term impacts that may result from the seismic surveys. Additional controls to ensure survey activity is away from slope waters by December when spawning occurs in key commercial species is also aimed at minimising impacts to spawning. Please also note that the timing of surveys is also subject to other considerations such as the timing of whale migrations. In regard to potential impacts on the rock lobster fishery, a review of impacts by seismic activities on rock lobster and planktonic larvae is provided below in Appendix 1, along with associated controls to manage these impacts. Discussion regarding displacement of fishers and associated measures by Spectrum to minimise this displacement is also provided in Appendix 1. Spectrum further appreciates the concerns raised regarding the 'knock-on effect' from rock lobster fisher displacement but is confident that disruption to fishing activities will be manageable by all parties, and not lead to this impact. Modelling of both single shot sites and cumulative sites (i.e. a number of sites along a survey line) predict that the ensonified area is up to 4.3 km for behavioural disturbance effects in squid and up to 260 m for behavioural disturbance and non-lethal effects on invertebrates (shellfish). There is no predicted mortality. The predicted ranges are based on using published and peer review thresholds or comparative values in other published papers (e.g. FRDC Day et al 2016 lobster/scallop study). Thus, he maximum extent of ensonification for squid based on the above predicted distance would be 4.3 km from the boundary of the Survey Area. Spectrum appreciates the concerns of fishers and is committed to avoiding or minimising potential impacts to squid that may result from the proposed seismic survey. With most of the intended survey area occurring beyond fishing depths the key area of potential overlap with fishing activities is along the continental slope and shelf break which support highly diverse and productive ecosystems (including the West Tasmanian canyons). Spectrum believes that the evidence of relevant scientific studies and the implementation of suitable management measures will ensure that impacts due to the proposed seismic survey will be short-term and localised. Spectrum also notes that the Operational and Activity Areas for the proposed survey do not overlap with the Bonney Coast Upwelling. Further, please note that sound exposure guidelines used to interpret modelling results were derived from a number of sources depending on the biota. For plankton, fish (larvae and adults) and eggs the guidelines set by the ANSI-Accredited Standards Committee S3/SC 1, Animal Bioacoustics Working Group (Popper *et al.* 2014) as well as McCauley et al. (2017) were used. For invertebrates the data provided by Day et al. (2016) were used, noting that there are no peer reviewed and/or recognised sound exposure guidelines for this group Spectrum appreciates the concerns of fishers and is committed to avoiding or minimising potential impacts that may result from the proposed seismic survey. With most of the intended survey area occurring beyond fishing depths the key area of potential overlap with fishing activities is along the continental slope and shelf break which support highly diverse and productive ecosystems (including the West Tasmanian canyons). As described in Appendix 1, Spectrum believes that the evidence of relevant scientific studies and the implementation of suitable management measures will ensure that impacts due to the proposed seismic survey will be short-term and localised. Spectrum also notes that the Operational and Activity Areas for the proposed survey do not overlap with the Bonney Coast Upwelling. Further, please note that sound exposure guidelines used to interpret modelling results were derived from a number of sources depending on the biota. For plankton, fish (larvae and adults) and eggs the guidelines set by the ANSI-Accredited Standards Committee S3/SC 1, Animal Bioacoustics Working Group (Popper *et al.* 2014) as well as McCauley et al. (2017) were used. For invertebrates the data provided by Day et al. (2016) were used, noting that there are no peer reviewed and/or recognised sound exposure guidelines for this group. Spectrum appreciates the concerns of commercial fishers but believes that any impacts due to the proposed survey will be short-lived and localised in extent. The above

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					comments highlight how complex a fisheries-related compensation process would be but are not considered relevant to the proposed survey. Spectrum commenced the consultation process in February 2018. Since that time the consultation process has been ongoing and broadening in scope as new stakeholders are identified and their contact details obtained (often via lengthy processes). To assist with identification and consultation of fishing industry stakeholders a Fisheries Liaison Officer and a Fisheries Consultant (both Victorian based) with existing relationships with many fishers were contracted early in this process. Spectrum appreciates the fact that various fishers contacted by SIV had already received information about the proposed survey and have met individually with Spectrum representatives to provide feedback. Spectrum notes that SIV has identified some entities who may not have had opportunity to provide feedback on the proposed surveys. This is quite possible because of the complex and fluid working relationship that sometime occurs between license holder, quota allotment and fishers. As such, Spectrum is keen to continue liaising with SIV whilst noting its belief that it has made all reasonable effort and has adequately liaised with all relevant license holders and fishers. Spectrum is keen to continue liaising with fishers and will discuss the proposed meeting with SIV. Spectrum is interested in receiving more information regarding the actions proposed so that they may be properly evaluated in context of the environmental impact and risk assessment already completed for the proposed survey. As a general statement, Spectrum believes that compensation as requested is not reasonable given the control measures in place to minimise displacement of fishers, the inherent variability in abundance of commercial fish species, and reasonable expectation that fishers can utilise alternative fishing grounds in the short term. Further information regarding the potential impacts and associated controls for the proposed survey is provided in Appendix 1. Spectrum believes it acceptable to compensate fishers for equipment that is damaged beyond repair and cannot be re-used as a direct consequence of survey activities. Spectrum is not aware of the rock lobster re-seeding work being undertaken and hence cannot comment on the rationale or objectives of that work, or its relevance to the proposed survey See response 8. See response 9. Spectrum directed SIV to refer to the responses made in the report provided to them on the 03/08/18 Spectrum is keen to continue liaising with fishers and will discuss the proposed meeting with SIV. The Survey Area shown in Figure 1 of Appendix 1 covers the maximum extent within which the seismic source (airguns) will be operational. The Operational Area described in the same figure in Appendix 1 of the response includes the additional area or turning of the seismic vessel at the end of each survey line, where there will be no seismic operations. Modelling of both single shot sites and cumulative sites (i.e. a number of sites along a survey line) predict that the ensonified area where fish could experience temporary (and recoverable) effects could be up to 3 km for demersal and pelagic fish species. Effects for other groups are predicted up to 4.3 km for behavioural disturbance in squid and up to 260 m for behavioural disturbance and non-lethal effects on invertebrates (shellfish). There is no predicted mortality. The predicted ranges are based on using published and peer review thresholds or comparative values in other published papers (e.g. FRDC Day et al 2016 lobster/scallop study). The maximum extent of ensonification based on the above predicted distances would be between 3 and 4.3 km from the boundary of the Survey Area. Appendix 1 provides a detailed description of the modelling and assessment. As discussed above please refer to the Survey Area described in Figure 1, Appendix 1 as this encompasses the area that will be ensonified at levels expected to have an effect on marine biota (based on literature values). The modelling and interpretation of seismic noise due to proposed survey has been objective, conservative, scientifically-based and robust. Spectrum believes that apart from a map showing fishing grids overlaying the survey area these maps have already been provided. Please confirm this request so that appropriate maps can be provided.

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					Spectrum believes that scientifically valid survey assessments of commercial species would require planning and resources that are not reasonable given the scale of the proposed seismic survey. See response 9. Spectrum appreciates the concerns of commercial fishers but believes that any impacts due to the proposed survey will be short-lived and localised in extent. The comments in SIV's report highlight how complex a fisheries-related compensation process would be but are not considered relevant to the proposed survey. Please note that pdf document '*Spectrum Otway Deep 3D MSS EP Stakeholder Consultation R3 - Fisheries*' previously sent to SIV for distribution to fishers includes description of the risk and impact assessment due to seismic noise during the proposed survey (Attachment E). This is based on information provided in the EP. Please also refer to Appendix 1 of the response for a review of fisher concerns. regarding the comment on CSELs, Spectrum engaged an independent applied science company to undertake underwater sound propagation modelling for the proposed survey and determine the spatial extent of potential sound impacts. In interpreting this data, the NMFS (2016) proposed dual criteria for the assessment of permanent and temporary threshold shift for marine mammals - single shot (per-pulse) and cumulative exposure (suggested over a 24 hour period). Spectrum also applied the peer-reviewed cumulative temporary threshold shift (TTS) SEL quoted by Popper et al. (2014) for TTS in fish. These criteria were used during the modelling. Spectrum is interested in viewing the reference document for the stated CSELs data as a potential source of new and relevant information, however the environmental impact and risk assessment for seismic activities that has been undertaken to date is considered to be scientifically valid and robust. Spectrum is aware of a study that the Northern Territory Seafood Council (NTSC) commissioned Curtin University's Centre of Marine Science and Technology (CMST) to conduct cumulative SEL modelling for a number of different line acquisition scenarios of different durations in order to understand how cumulative sound exposure levels (SELcum) changed. The NTSC specifically questioned the Bethany marine seismic survey EP with regard to their concerns about the appropriateness of using a 24 hour period to assess SELcum and the potential for TTS and other effects associated with SELcum. Spectrum have reviewed the CMST modelling and NTSC concerns and highlights a key limitation of the modelling below is that it does not account for the hearing abilities of fish or biological effects of the SELcum. Modelling of SELcum over periods of 24 hours or longer assume that very distant single shot SELs will be audible to fish and contribute to hearing fatigue that may eventually result in TTS. In reality, fish will not hear sound over these distances, hence including the accumulated sound energy from distant shots over a full 24-hour period SELcum is considered to be conservative. The 24-hour modelled scenario accounts for a) the relatively rapid accumulation of sound at close range to a fish, plus b) a significantly greater amount of sound produced over the 24 hours that fish are unlikely to actually hear. Professor Arthur Popper was asked to provide expert peer review of the Bethany EP underwater noise assessment for TTS in fish (Popper 2018 – in Appendix 4 of the EP Summary available from: https://www.nopsema.gov.au/assets/epdocuments/A601445-EP-Summary-redacted.pdf) Popper (2018) highlighted that it is important to consider how much of the sound is received (heard) by individual fish in a population. Fish will only hear and be exposed to relatively "loud" sounds for a relatively short period of time, relatively close to the sound source. Popper (2018) further explains within his report that the effects of TTS are unlikely to show up in fishes until the intensity of the sound is well above the fish's hearing threshold. For fish species that are free swimming (which include key commercially targeted species) it is likely that there would be no TTS effect whatsoever since fish will likely move away from the sound source. Based on the independent, expert peer review by Popper (2018) and review of CMST (2018), it is confirmed that the 24-hour period selected to assess SELcum and any associated effects is likely to be highly conservative for assessing the potential effects to commercially targeted fish. NOPSEMA further noted in their Statement of Reasons for acceptance of the Bethany EP (available from: https://www.nopsema.gov.au/assets/epdocuments/A595612-Bethany-Statement-of-Reasons.pdf) the following: Popper (2018) concluded that the most likely effect on fish in the acquisition area is TTS and as most fish in the survey area do not have hearing specialisations, fish are not likely to have much (if any) TTS as a result of the survey. If TTS is experienced, the level would be low and recovery would start as soon as the most intense sound ends and would be

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					within 24 hours. This supports the conclusion that the evaluation of TTS effects in fish in the environment plan is conservative and that any TTS effects that are realised in fish will be temporary and likely to recover within 24 hours. In addition, Popper concluded that it is highly unlikely that there would be physical damage to fish as a result of the survey unless the animals are very close to the source (within a few meters). The environment plan follows a very precautionary approach to addressing scientific uncertainty associated with predicting potential impacts to fish following exposure to sound. A very conservative estimate of the proportion of fish assemblages within the acquisition area that could incur mortality, physical injury or ITS effects is provided and this is used as the basis for selecting appropriate control measures and demonstrating acceptable levels of impact. The environment plan has included well supported and reasoned arguments for the inclusion and exclusion of controls to prevent, mitigate and manage impacts on fish from noise. Controls being implemented include timing the survey to avoid key fished species spawning periods, using the smallest seismic source possible, undertaking soft start procedures and restricting infill activities. Spectrum has also adopted cumulative SEL as the TTS threshold for exposure in fish and which based on the above expert review is deemed to be conservative, and that any TTS effects in fish will be temporary and likely to recover within 24 hours. Spectrum note SIV's request for cumulative TTS to be considered for lobsters, however there are no published studies or peer reviewed literature that proposed a cumulative threshold. Experts in the field that have studied marine invertebrates after exposure to acute low-frequency sound found no increased mortality due to airgun exposure in scallops up to ten months after exposure (Parry et al., 2002; Harrington et al., 2010; Przeslawski et al., 2016, Bruce et al. in press), clams two days after exposure (La Bella et al., 1996), lobsters up to eight months after exposure (Payne et al., 2007; Day et al., 2016), or crabs up to two years after exposure (Morris et al. 2018). Please refer the detailed comment regarding cumulative sound exposure above. Spectrum also notes that pdf document '*Spectrum Otway Deep 3D MSS EP Stakeholder Consultation R3 - Fisheries*' previously sent to SIV for distribution to fishers includes description of the impact assessment due to seismic noise during the proposed survey (Attachment E). This assessment is focussed on the proposed survey and Spectrum does not consider it necessary or feasible to include the requested map showing the biomass of rock lobster from settlement to 7 year of age since 2015. Spectrum is not aware of the rock lobster re-seeding work being undertaken and hence cannot comment on the rationale or objectives of that work, or its relevance to the proposed survey. Spectrum has made multiple attempts to contact SIV and arrange another face to face meeting with their members (see row below), with no response from SIV. Via phone call 03/08/18: Phone call to SIV to confirm that SIV had received the Spectrum response to the report. No answer.
	24/08/18 28/08/18 28/08/18 29/08/18 30/08/18 11/09/18 12/09/18 13/09/18 17/10/18	SMS outgoing Phone call outgoing SMS incoming Phone call outgoing Email outgoing Phone call outgoing Phone call outgoing SMS outgoing Phone call outgoing	Via SMS 28/08/18: SIV stated they would phone Spectrum back the following day. Via phone call 17/10/18: SIV answered Spectrum's phone call and stated they would attempt to send feedback through in the next two weeks. No further contact was made by SIV.	No new objections or claims.	Via SMS 24/08/18: Spectrum sent SIV an SMS to say that payment for the consultation engagement should have cleared. Via phone call 28/08/18: Spectrum called to determine if SIV had a response to the comments provided by Spectrum on 03/08/18. No answer. Via phone call 29/08/18: Spectrum called to determine if SIV had a response to the comments provided by Spectrum, and to enquire as to the status of the final report which was not yet received. No answer. Via email 30/08/18: Spectrum stated that they were hoping to organise a visit soon. They also requested clarification of the following: Confirmation that Spectrum's response on the 3rd August has been provided to SIV members for their feedback If SIV could collate this feedback and provide it to Spectrum before the next meeting If it is possible for SIV to provide a list of members that intend to meet with Spectrum Via phone calls and SMS 11/09/18 to 13/09/18: Spectrum called and texted to determine if SIV had a response to the comments provided by Spectrum, and to enquire as to the status of the final report which was not yet received. No answer.

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					No feedback on Spectrum's response to their draft report has been received to date, nor a final report. However, this stakeholder is considered relevant and Spectrum will continue to consult with them and work towards addressing their concerns as part of the ongoing consultation process.
	19/12/18 14/01/19 14/01/19	Email incoming Email outgoing Email incoming	Via email incoming 19/12/18: SIV provided Spectrum with their final draft report. SIV expressed their apologies for not sending the report to SPU a few weeks back. The Victorian election and other commitments as a part of this completely consumed SIV's attention during October and most of November. SIV's representative stated that they are now on annual leave. States that they are happy to take comments on the report, and appreciate Spectrum considering their position and industry feedback on Spectrum's initial response to SIV's first Draft. SIV remains committed to working with Spectrum and ensuring that their fishing industries concerns are respected and addressed appropriately. The following concerns were raised in the SIV final report in addition to the draft report submitted on 25/07/18: Part 1 How do you classify 'fishing depth'? Fishers will fish where their licence entitles them to, as presented in our initial draft response, there are fishers who fish within this area. Simply shooting seismic in deeper waters does not mean the survey area is beyond fishing grounds, as fishers fish all levels of the water column for varying species. Most importantly is the potential impact to future recruitment of Rock Lobster, Giant Crab and other fisheries resources. The free-swimming larval stages do not know boundaries and are suspended in the moving currents for up to 24 months, well beyond the 'fishing depths' referred to above. Can you please confirm what the definition of 'not be operational' is? Will they be completely switched off, or will they be turned down? Yes, we appreciate that acquiring of data on occurs within the Operational Area, however the sound reach will be considerably larger should the seismic guns not be completely switched off before exiting this area. Comment received from industry, which has been presented to the oil and gas industry for some time now, is the 'selective' use of research – 'cheery picking'. And this has again occurred in the Spectrum response and perceivably in the Environment Plan. There are any number of research papers that discredit the pieces of work here from across the world, and we again enter the realm of using what information is best for the work you want to undertake. A precautionary approach would suggest recognising there may be an impact and working collaboratively with the fishing industry to arrive at mutually acceptable ground. However, this response suggests that Spectrum are reverting to the adoption of 'we have no impact' and is not conducive to open and transparent consultation. This level of mis-understanding of the operation, sustainability and management of fishers is not acceptable. We (industry and Government) manage our fisheries to sustainability, economic, social and environmental targets – the whole idea of just 'use alternative fishing grounds' is not acceptable. The simple response stating 'inherent variability in abundance' as a reason that compensation is not reasonable is also not acceptable. Victorian fishers and managers use the best available scientific evidence to base their decisions of future management arrangements for fisheries. This includes continued rebuild of stocks, through managing recruitment and also ensuring spread of effort as to avoid any possibility of localised depletion (not good). And what Spectrum are promoting or suggesting 'its expectation' is that people will just move and fish alternative grounds in the short term is not supported, nor accepted as an strategy by the fishing industry.	Claims included that the seismic survey would displace fishers, reduce economic opportunities, impacts to RL larvae and subsequent recruitment, impact on physical injury to squid adults and eggs and plankton, concern regarding the use of Day et al. 2016 to define limits of sound exposure, impact of seismic sound on reproduction and larvae, and subsequent recruitment, cumulative impacts from other surveys, concern 24hr CSELs, and compensation. SIV requested an independent review of the impact buffer proposed for the survey. SIV's are merited given the function the association serves for its members and the concerns of its members regarding the potential impacts of seismic sound on fish/invertebrate stocks and catches. Action: Spectrum to review SIVs final report and provide a formal response to SIV to each query and concern raised in their report.	Via email outgoing 14/01/19: Spectrum thanked SIV for providing their report, although it was provided later than agreed, it did not have a material impact as Spectrum have delayed the survey season to allow for more consultation. Spectrum informed SIV that they are in the process of responding to SIV's comments and will need SIV's assistance in disseminating the response to their members via email when it is ready, as part of ongoing consultation. Spectrum requested confirmation from SIV that this would be possible.

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			This option is rejected and if there is direct impact on fishing operations there must be consultation with those operators around adequate compensation. Further to the comment on 'inherent viability in abundance', as mention previously with fisheries management decisions being based on the best available scientific evidence, these decisions currently have a level of understanding of different factors built into them. Allowing for resource sharing, climate change, recruitment and abundance levels – what they do not allow for in their rebuilding strategies is a sudden pulse of lack of recruitment due to larvae being killed by a seismic operation. Therefore, this comment by Spectrum only confirms the limited knowledge and understanding of fisheries, their operations, industry movements and the science that underpins a precautionary approach. We do not support the approach presented and seek further engagement on this. Yes, we have always acknowledged that there is potential for overlap in consultation through SIV and other consultation measures that Spectrum have engaged through, however this consultation process by SIV has also reached Commonwealth fishers who had not been informed of the Spectrum survey to date. Until SIV was engaged to undertake this consultation process on behalf of Spectrum, with the fishing industry, it is ultimately clear from responses that there was a distinct lack of understanding of all aspects of the proposed Spectrum Geo Otway Deep Seismic Survey which clearly illustrates that previous consultation processes employed by Spectrum were inadequate. The fishing and seafood industry do not accept the above response as acceptable, in fact we are concerned that this is the position presented by Spectrum. Our fisheries management decisions are based on the best available science, and for example we know that for Rock Lobster approximately 1% of the larvae that are produced (between September and November) ever survive to settle on the reef. This process for years has supported a strong, vibrant commercial fishery, and we cannot support any activity that will put this process in jeopardy – noting the outright rejection of compensation and or other funding models presented. Simply stating that Spectrum will ensure survey activity is away from slope waters by December when spawning occurs in key commercial species, is incorrect – and questions whether the Table 1 of SIV's earlier report (also included in this report) was even considered or reviewed. SIV has been leading industry representation and consultation with oil and gas institutions for many years now, and the fishing industry has recognised there is a need to work collaboratively. Hence the presentation in our earlier report of the options (specific to Rock Lobster) that need to be considered across the impacted species. For example: The Origin Crowes Foot and Enterprise II survey of 2016/17 saw industry engagement like never before, and we are happy to consider options relevant to this survey to apply to the fishing industry. We would expect negotiations to begin to discuss compensation/quota retirement for displaced fishers. This would require one-on-one consultation and negotiation with impact fishers to determine previous effort and opportunity in the affected area, not displacing this effort to another area as has been previously presented by Spectrum. The fishers would retire their quota 'for the benefit of the resource' and Spectrum would compensate them accordingly. Spectrum must consider opportunities for funding re-seeding programs for Rock Lobster - given the scientific uncertainty of the long term impact an appropriate precautionary mitigation would be to make contribution to the upcoming rock lobster reef re-seeding		

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			program which seeks to assist in restoring the marine environment following the damage done by seismic air-guns. At present the Victorian Rock Lobster Association are working with science experts, Government and industry to operationalise a rock lobster reef reseeding program – noting the lack of understanding of impacts to recruitment and on larvae/settlement – they are getting on the front foot and looking at further opportunities to rehabilitate impacted areas. This has been possible due to 'Community Benefit monies' from Oil and Gas companies, with fishing industry research money to provide a positive collaboration and hopefully future benefit for our fisheries resources. While the impact of such work is yet to be seen, the collaboration is positive and we would welcome other parties interest to grow the scale of this work. Spectrum state the will 'continue to advise relevant fishers', can you please advise how Spectrum intend to do this, by what means? And can you please confirm this is solely in relation to avoiding or minimising conflicts on the water? Can Spectrum detail how they conclude that one month exclusion from a fishing ground is classified as acceptable, and is not 'long-term displacement'? This is not acceptable to the fishing industry who fish different grounds, different species and different gears throughout the year to provide fresh seafood for Australian consumers. Yet one month complete exclusion seems to be acceptable in preparing Spectrum's report – what is this based on? This comment by Spectrum on the 'Impacted by Survey' part on the larval table, is simply incorrect. It blatantly ignores the commentary in the same table in the 'Spawning Activity / Species Biological Depth Range' column. spawns Jun to Aug and hatches September to November larval stages spend from 9–24 months at sea (<150 m depth range) and become widely distributed before metamorphosing to post-larval puerulus, which swim towards the coast and settle larval settlement highest during winter with peak settlement observed in August in each VIC/SA/TAS. A second, less prominent settlement peak can sometimes occur in December/January in TAS and VIC In addition to the above comments there were 7 additional next steps/additional comments Spectrum Geo to consider the further information provided by industry (via SIV) and appropriately respond in due course. Following response to this Final Draft report, Spectrum and SIV to discuss: Industry meetings (as appropriate) with Rock Lobster and Giant Crab fishers, and other affected fishers. Spectrum Geo to further consider the presentation of sound reach maps and confirm how these will be complied with or measured (similar to those provided above for Crowes Foot Survey). Noting Spectrum's initial response of: the Survey Area, encompasses the area that will be ensonified at levels expected to have an effect on marine biota (based on literature values). The modelling and interpretation of seismic noise due to proposed survey has been objective, conservative, scientifically-based and robust. This is not accepted by the seafood industry, and we again seek provision of maps that detail the 'sound reach'. Spectrum Geo to again consider options for working with industry in a pre/post survey assessment which will contribute scientifically to the knowledge of interaction of seismic operations with fisheries resources. Noting comments to Draft Report of: Spectrum believes that scientifically valid survey assessments of commercial species would		

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			require planning and resources that are not reasonable given the scale of the proposed seismic survey. Response: Being reasonable and practical, we need to have further discussions towards delivering on this. The simple rejection due to 'planning and resources' is not acceptable to the fishing industry. We are committed to proper engagement and believe this is a necessary instrument towards successful collaboration. Spectrum Geo to enter negotiations with SIV identified 'potentially affected' persons regarding potential compensation. Spectrum Geo to act in 'good faith', noting the upcoming changes to consultation requirements, provide SIV with a draft copy of the Full Environment Plan, and allow an opportunity to comment. Spectrum Geo to work with SIV on opportunities for fisheries 're-seeding' work, in particular the work being undertaken for Rock Lobster at present. With further information presented in this report, we seek continued discussion on this, and seek Spectrum's interest in engaging in the work being undertaken to rehabilitate Rock Lobster reefs. Part 2 It was noted that all Western Zone Rock Lobster fishers rights are displaced by this survey, reducing their economic opportunities. And there was significant concern as to how this will impact the Rock Lobster fishery with the extent of the activity to span two peak seasons – summer season of 18/19 and 19/20 – why is there a need for this? Does Spectrum realise that summer is right after the Rock Lobster spawning period (our closed season) and this has the potential to significantly impact our fishery recruitment of larvae? One element raised was that any action which has the potential to reduce viability in one sector of the commercial fishing industry always has a knock on effect in another. Therefore, by simply making a fisher move from a ground they are fishing (due to exclusion areas from a seismic survey, etc), does not mean fishing effort will be reduced. Fishing effort remains constant, but moves from area to area, fishery to fishery, therefore if one fisherman is no longer viable in their fisher they move to another fishery/area, adding pressure to that fishery/area. This must be kept in mind as this has the potential to increase the number of potentially impacted people in the fishing industry. Serious concerns raised about the impact of seismic testing on squid migratory patterns. The area under consideration includes the Bonney Upwelling which as you would be aware is a major food source for many animals along the western Victorian coast. o Therefore, the impact on this area of significance to the vast majority of Victorian fisheries as their larval stages tend to be suspended in the water column for considerable periods of time. Concerns were raised about the impacts of seismic on squid reproductive organs and squid eggs. Significant weight needs to be given to concerns about the proven impact of seismic on plankton, which is a major food source for squid. It was also noted that Squid and scallops have similar sensory organs and we know what happened to scallops. There must also be serious considerations of the impacts to other finfish and their reproductive, spawning and aggregation phases. Rock Lobster fishers from Apollo Bay raised serious concerns following the research published by McCauley et al. 2016 and the potential impact on Rock Lobsters, but also Giant Crabs. Southern Rock Lobster will be impacted sub-lethally based on McCauley et al. (2016). These findings found mortality did not occur post exposure when kept in an ideal controlled environment, but questioned survival in the wild - catch ability, reproduction etc. Lack of scientific certainty should not be used to avoid adopting mitigation control measures.		

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			Research on damage to Rock Lobster concludes that this damage is likely to be applicable to all crustaceans which includes Giant Crab. There is currently no known safe range for fish resources from seismic operations, i.e. we don't know how far beyond 500 m the array would need to be from a lobster to not see an effect. This raises questions on the use of Day et al. (2016) as the definite limit of sound exposure. Therefore, we request an independent review of the impact buffer. Particularly November-January, is the most important period of the year for spawning and larval dispersal of most species. Some species aggregate to spawn and undertake an annual migration to spawning areas, which must occur over a period prior to initiation of spawning. Any disruption of the migration, spawning or larval life cycle while suspended in the water column has every possibility of significantly impacting recruitment and settlement into a fishery. This is a very serious matter that must be considered before any seismic operations occur. While timings of reproduction and likely occurrence of larval stages can be defined from literature, for most species there is little information on the 'specific' locations and spatial extent of spawning along the western Victorian coast. Richardson et al. (2017) - state their findings (95% recovery 3 days post survey) should not directly be applied quantitatively to other regions with different oceanographic conditions. And stressed that a detailed study of a particular region would be needed to quantify the spatial and temporal impacts in a particular region and season. Some cold and deep areas with slower growth rates / longer reproductive cycles it can take a year for plankton to regenerate. Denuding a large region could have recovery rates significantly hampered. There is significant and alarming potential that any denuding from the Otway Deep MSS will be further compromised with 3D Oil's Dorigo MSS in nearby waters. How has this been considered in your EP? To meet ALARP and an Acceptable level – We seek commitment to undertake a regional study to quantify the spatial and temporal impacts, including water column testing for eggs & larvae of fisheries resources. Can Spectrum please confirm that all seismic activity will only occur within the acquisition area? Will line turns (4.5 hours duration) be made within the primary acquisition area? If not will the seismic air-guns be switched off prior to existing the primary acquisition area on turning procedures or simply powered down? A recent study finding show that the 24-hour period cumulative sound exposure levels (CSELs) values are shown to be reached in minutes. What control measures will be adopted to address these findings? CSELs must be investigated on the already weakened lobsters under the new findings on cumulative sound exposure. Temporal impact spans three years 2018, 2019 and 2020. To what extent has this been considered by Spectrum Geo? To meet ALARP in the eyes of Victorian Rock Lobster fishers, Spectrum must: remove all potential RL habitat (<150m) from survey. We would expect negotiations to begin to discuss compensation/quota retirement for displaced fishers. Spectrum must consider opportunities for funding re-seeding programs for Rock Lobster - given the scientific uncertainty of the long term impact an appropriate precautionary mitigation would be to make contribution to the upcoming rock lobster reef re-seeding program which seeks to assist in restoring the marine environment following the damage done by seismic air-guns. To meet ALARP for Victorian Giant Crab fishers, Spectrum must: Extract Giant Crab habitat from the survey. Engage in compensation/quota retirement for displaced fishers.		

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			Southern Rock Lobster is harvested as a percentage of biomass. Placing 15% of the biomass at known risk threatens the both the long-term and short-term economic value of the Western Zone Rock Lobster Fishery. Evidence: As a measure of impact Western Zone Rock Lobster Total Allowable Catch (TACC) halved since heavy seismic activities in the Otway Basin in the past decades. Via email incoming 14/01/19: SIV responded to spectrums email outgoing stating they are able to provide Spectrum's response to their report to their members. Inquired as to how long the response will take.		
	01/02/19 06/02/19 13/02/19 13/02/19	Email outgoing Phone call outgoing Phone call outgoing Phone call outgoing	Via phone call outgoing 13/02/19: SIV stated they are currently busy at the moment with the Apollo Bay Seafood Festival. SIV stated they will be able to mail out the stakeholder update and also Spectrum's response to their feedback by middle of next week, probably 19th or 20th February. SIV stated they will push for feedback within 2 weeks and let Spectrum know which of their members want to meet.		Via email outgoing 01/02/19: Spectrum thanked SIV for confirming their willingness to provide their members with spectrums consultation update advising the change in the survey time frame. Spectrum provided the updated stakeholder consultation update (3rd formal notification 3A General) to be sent out. Spectrum stated they are currently working on their response to the concerns raised in the final draft response provided by SIV, and that the technical comment of the question is appreciated. Spectrum stated they are aiming to have the response to SIV's report by the end of the next week. Via phone call outgoing 06/02/19: Spectrum attempted to contact SIV, however no answer or return phone call was made. Via phone call outgoing 13/02/19: Spectrum attempted to contact SIV, however no answer or return phone call was made. Via phone call outgoing 13/02/19: Spectrum phoned SIV to discuss the distribution of the stakeholder material.
	05/03/19 12/03/19 20/03/19	Email outgoing Email outgoing Email outgoing			Via email outgoing 05/03/19: Spectrum apologised for not having the response to the final report completed yet and stated the response should be delivered shortly. Spectrum requested if in the meantime, Spectrum's' updated stakeholder consultation update (3rd formal notification 3A General) could be sent out to SIV members. Spectrum apologised as both the response to the report and the update were to be sent together, however as the response is not completed yet, request that SIV send the updates separately. Via email outgoing 12/03/19: Spectrum stated they are finalising the response to SIV's final report, however requested if the stakeholder update (3rd formal notification 3A General) could be sent out in the meantime. Via email outgoing 20/03/19: Spectrum provided responses to Part 1 of SIV's final report dated 19/12/19. Each point raised by SIV has been responded to below, with numbers corresponding to the issues raised in rows above. Spectrum also attached the Jasco Sound Modelling report for SIV to view. Responses to Part 1 of SIV's 19/12/19 report: Spectrum appreciates that fishers are able to fish where ever their licence entitles them to. However it is also the case that the jurisdiction of many fisheries include large areas that are beyond the depth range (and/or travel distance) of fishers. Therefore, fishing depth information is important for assessment of potential impacts from the MSS. This information is obtained from fisheries websites, fisheries management plans and relevant stakeholders. Spectrum also appreciates the concern expressed about potential impacts to future recruitment of target species. This mirrors concerns previously voiced by fishers over the potential impacts of seismic activities on adult and planktonic stages. Based on a review of available information Spectrum notes that it is likely that some of these species may spawn within the Activity EMBA during the survey period. However as described in the response to the initial SIV Report, the spatial extent of spawning by these species is broad and the intermixing of eggs and larvae due to planktonic drift is expected to minimise any localised and short-term impacts that may result from the seismic surveys. The additional control to ensure survey activity is away from slope waters by December when spawning occurs in key commercial species is also aimed at minimising impacts to spawning. Please further note that the timing of the Otway Deep MSS has to take into consideration potential impacts to other sensitive receptors such as cetaceans and their annual migration periods.

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					Spectrum confirms that the operational area is a 'buffer' around the survey area in which activities such as streamer deployment and retrieval, maintenance and recovery, and vessel manoeuvring (line turns) occurs. The airguns will be disabled and there will be no acoustic discharge in the operational area. Spectrum has based its impact and risk assessment on a literature search of all available information, with particular emphasis on peer-reviewed literature sources. Where available, the assessment is also based on accepted guidelines, for example the thresholds for harm to fish species have been based on the sound exposure guidelines for fish proposed by the ANSI-Accredited Standards Committee S3/SC 1, Animal Bioacoustics Working Group (Popper et al. 2014). Spectrum has not selected literature in a biased manner, and strives to provide a balanced view in its use of all information. Please also note that where uncertainty occurs in the assessment of impacts and risks a precautionary approach has been taken. This is also inherent, for example, in the guidelines proposed by Popper et al. (2014) which use the "recoverable injury" sound level as a "mortality and potential mortality" threshold in the absence of data on mortality levels. Spectrum is also keen to work collaboratively with the fishing industry to arrive at mutually acceptable ground. This is demonstrated through changes made to the original plans for the South Acquisition Area to avoid overlap between survey and fishing areas along the continental slope identified through consultation with crab fishers. This change also minimises overlap with fishers in the Commonwealth Scalefish Hook Sector who may fish continental slope waters to 800 m depth. In addition, Spectrum is also working with trawler operators to ensure the OBNs are not placed on trawl grounds. These and other examples of modifications to the MSS in response to stakeholder feedback have previously been provided in Stakeholder Updates and the response to the First Draft report. Please also note that Spectrum is committed to ongoing consultation with Victorian and Tasmanian-based fishing stakeholders and appreciates that SIV and TSIC are the appropriate industry bodies for doing this, as demonstrated in their engagement in the current industry consultation process. Spectrum's comment shown above is not meant to be a statement about broader fisheries management. It is a reasoned view, based on relevant information including fisheries management plans, catch and effort statistics, fisheries website and stakeholder feedback. It is appreciated that fishers are concerned about displacement from fishing grounds, however Spectrum maintains its view that in most cases the area in which there is direct overlap between fishing and survey activity represents a very minor portion of the overall area in which fishing can occur. Furthermore, as long as fishing vessels observe maritime requirements of remaining clear of the seismic vessel whilst it is restricted in ability to manoeuvre, the actual displacement from fishing grounds will be negligible in most cases. The exception to this appears to be the Victorian Giant Crab Fishery, particularly because fishing pots used in this fishery are typically left on the seabed for a minimum of 48 hours before retrieval. This means the 2-3 fishers active in this fishery are more prone to displacement as a consequence of survey activities than are more mobile fishers such as trawler and line fishers. It also means that their fishing equipment is more prone to inadvertent loss or damage through survey activities if set in the area being actively surveyed. Nevertheless, the overlap between operational and fishing areas is expected to be less disruptive to giant crab fishers than indicated above. Firstly, spatial overlap between individual survey swaths and the area of the giant crab fishery are much smaller than the overall overlap with the operational area described above. Within the Central Acquisition Area where potential disruption is most likely, these swaths are orientated such that they overlap only a small area of the continental slope at their nearshore end before extending out to deeper waters. For Swaths 1 - 4 the area of overlap (including the turning circle of the seismic vessel) ranges from 43 to 319 km2, which represents between 2.1 and 16.6% of total fishing area (conservatively between 150 and 400 m depths) for the Victorian Giant Crab Fishery. No overlap at these depths in Swath 5. Swath 2 has the largest percent overlap, with the average for Swaths 1 – 4 being 6.9%. Secondly, the time period for completion of each swath varies from < 7 to < 40 days, with Swaths 2 and 3 taking the longest period (< 40 days). However, if seismic acquisition commences on the 1st October there will be a 47 day period before the start of the giant crab fishing season on the 16th November. This means that Swath 1 will be completed and there will be < 7 days left to complete the survey of Swath 2 by the time the fishery opens, with the remaining swaths (3-5) having no or minimal overlap with the area of the giant crab fishery (maximum of 43 km2).

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					There will also be an overlap of only 16 days between the start of the open season for the Victorian Giant Crab Fishery (16th November) and the limit imposed on acquisition of survey data at depths less than 500 m (1st December), due to the control measure aimed at minimising impacts to the spawning output of commercially important fish species. This temporal overlap represents 9 and 5% of the overall season in which fishers can capture female and male giant crab, respectively. It is noted that the turning circle of the seismic vessel may still extend into waters shallower than this imposed limit at the end of each swath, however the seismic vessel has greater flexibility in the route it can take to avoid impacting other vessels or objects such as fishing floats at that time. Based on the above assessment, impacts to commercial fisheries as a consequence of the proposed MSS are expected to be minor. Further, with adequate advance notification of activities by Spectrum, on-water communications between vessels, and the reasonable assumption that fishing gear including giant crab pots are satisfactorily marked so that they can be readily spotted at sea by the support vessel located ahead of the seismic vessel, it is unlikely that fishing equipment will be accidently damaged or lost as a consequence of survey activities. Nevertheless, Spectrum appreciates the impact that such an event may have on fishing activities and agrees to compensate the rightful owner of equipment lost or damaged as a consequence of survey activities, along with associated loss of catch for the fishing trip in which loss or damage occurred (provided that this has been adequately substantiated). Please note that Spectrum is aware of the ongoing concern about this and welcomes specific feedback about fishing operations within the survey area that can further inform decisions or manage misconceptions around this issue. Spectrum appreciates this feedback and agrees that SIV has an integral role in the consultation process with the fishing industry. SIVs position regarding potential impacts on spawning by fish is noted. However Spectrum stands by the assessment of this provided previously in Stakeholder Updates and in the First Draft report. This assessment is also based on the best available information, and the associated controls (including ensuring that survey activity is away from slope waters by December) is based on spawning of commercially important species expected to be found in the area of the survey. Please note that Spectrum's assessment of literature information indicates that the species referred to by you in Table 1 – pilchard, anchovy, King George whiting, Australasian snapper, blue throat wrasse, southern rock lobster and scallops – are not expected to be located in the survey area nor impacted by seismic noise. It is Spectrum view that SIV plays a lead role in representing and consulting with Victorian state commercial fishers. As such, Spectrum will continue to liaise with SIV to ensure that these fishers continue to be properly consulted with. However, please also note that decisions around reducing impacts and risks of the proposed survey to as low as reasonably practicable (ALARP) is based on weighing up the magnitude of impact or risk reduction against the cost of that reduction. This is a case-by-case and context dependent evaluation, and Spectrum does not believe that decisions made for other surveys are necessarily relevant to its proposed MSS. This is the case with the Origin Crowes Foot and Enterprise II surveys, and Spectrum believes that compensation beyond that already proposed for loss/damage to fishing equipment and associated catch is not appropriate given the control measures in place to limit impacts to fishers. Furthermore, the minimal overlap of survey area with rock lobster habitat (122 km^2; or 0.8% of the area of the fishery within the Warrnambool Region) and fact that the survey will only be acquiring data in that area for a total of four days means that a contribution to rock lobster reef re-seeding is not justified in this instance. Spectrum will continue to advise relevant fishers via a range of methods. In particular, Spectrum wishes to continue working with SIV in their capacity as the representative peak body for Victorian commercial fishers. Likewise, Spectrum will continue liaising with TSIC and AFMA in their representative roles. Please note that advise to relevant fishers includes all information about the proposed survey that is applicable to their operations. This is not just in relation to avoiding or minimising conflict on the water, which was a statement made in response to a specific comment. The one month time period is based on operational considerations and is provided so that fishers and other stakeholders may plan their fishing activities with an understanding of where the survey vessel will be located. It is important to note that fishers and other stakeholders may still operate in or move through the same zone in which the survey vessel is actively acquiring seismic data, as long as maritime law is

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					maintained, and thus fishers are not excluded from the entire survey area for a total of one month.. Spectrum believes that its assessment of the impacts to rock lobster is thorough and acceptable. Because of the complex and long spawning and settlement process for this species additional information has been provided to cover the whole of this process. The following excerpt from the EP demonstrates this: 'Southern rock lobster are broadly distributed across southern Australia in depths of 1 to 200 m (Section 4.5.5.1.2). Across their range they are considered a single biological stock due to the broad spatial and temporal range of larvae. Mating occurs in autumn/winter, with eggs held by the (berried) female until release between September and November. The planktonic phyllosoma stage can be found hundreds of kilometres offshore during a protracted developmental stage lasting up to 23 months. The subsequent settlement (puerulus) stage swims inshore to settle onto reef habitats in depths shallower than 50 m (Section 4.5.5.1.2). Adults may not move far once they settle, and movement into deeper waters is slow (less than a kilometre per year in most areas; PIRSA 2013). Impacts of the proposed survey on pelagic and benthic life history stages of southern rock lobster are therefore expected to be minor. For benthic adults they will be limited to small areas of the Central Acquisition Area in VIC waters where depths are less than the maximum depth limit of 200 m for this species (noting that seismic activities in SA and TAS waters will occur in depths greater than 200 m). Underwater sound modelling was carried out for the Otway Deep MSS for an airgun array source level of 3,475 in3. Received levels were predicted at the seabed for single shot (per-pulse) and compared with the maximum received level (209 dB re 1 µPa) recorded by Day et al. (2016a) that resulted in sub-lethal effects in lobsters. Sound modelling results for the Otway Deep MSS predicts potential for sub-lethal effects (no mortality) in lobsters between 175 and 260 m from the seismic source (Table 6.7). These predicted distances are consistent with the distances measured by Day et al. (2016) (i.e. sub-lethal effects up to 166 to 232 m from the seismic source). The area of rock lobster habitat (<200 m depth) that may be exposed to sound levels above the 209 dB threshold is 122.2 km2 (or 0.8% of the Western Zone Warrnambool Region of the VIC rock lobster fishery). This area is located within the Central Acquisition Area, as there is no overlap with rock lobster habitat/biological depth range by the Otway Deep West and South Acquisition Areas. The vessel will be acquiring in water depths of 200 m or less for a total of 4 days (including consideration of downtime) spread over a period of 50 days within Swaths 1 and 2 of the Central Acquisition Area, (noting that the duration of Swaths 1 and 2 is 50 days). Given the maximum depth range of this species (<200 m), this is the maximum duration that rock lobster would be exposed to sound levels that may cause sub-lethal effects. Modelled estimates indicate that 708 t of legal-sized rock lobster biomass (ie greater than carapace lengths of 105 and 110 mm for females and males, respectively) was present in the Warrnambool Region during 2016/17 (VFA 2018). This estimate provides a general measure of fishable stock, Assuming that this biomass is evenly spread across rock lobster habitat (ie to depths <200 m), 5.7 t of this biomass would have come from the area ensonified by the MSS (0.8% of the Warrnambool Region of the Western Zone). This assumption may not be valid, however, due to spatial variation in growth rate and movement patterns of rock lobster (PIRSA 2013). With respect to berried females in the ensonified area, the study by Day et al. (2016a) reported no effects on embryos early in development within 1 to 1.5 km of the seismic source. Furthermore, the period during which females carry the eggs prior to release occurs from June to August, which is outside of the survey period, and many females will have released their eggs by the time the survey commences (i.e. hatching commences in September). However, hatching will continue to occur from October to November, i.e. at the time when the seismic survey is proposed, and so there is potential spatial and temporal overlap with rock lobster larval stages (nauplius and phyllosoma phases). The modelling predicts the spatial extent of ensonification would only extend 110 to 166 m from the source (Section 6.1.4.1.1) within the rock lobster habitat, i.e. <200 m water depth, and over a period of 4 days spread over 50 days duration. Recent studies have investigated the impact of seismic sound on lobster embryos (Day et al. 2016b) and reported that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure (Day et al. 2016b).

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					Any potential impacts on larval biomass is expected to be very localised and short-term, with negligible population level effects compared to the natural high rates of planktonic turnover. Based on the above assessment, impacts to rock lobster life history stages as a consequence of the seismic survey are therefore expected to be minor'. Noted. SIV to refer to the response documented in the email outgoing dated 20th March 2019. Noted. Spectrum is happy to meet as requested and has been making appropriate arrangements in liaison with SIV. Please note that detailed information regarding sound modelling has previously been provided in Stakeholder Updates and in the response to the initial SIV letter. In response to this specific request for sound reach maps please refer to the Otway Deep Marine Seismic Survey Acoustic Modelling report (Appendix 1). Spectrum is aware of the logistics and costs of undertaking proper scientifically valid pre/post survey assessments, in particular in offshore deepwater locations such as where the survey is planned. It is appropriate that further discussion be had on this topic however this needs to be done in context of the planned survey and associated impact assessment. It is Spectrum's view that this discussion should be industry wide and led by government. As discussed above, Spectrum maintains the view that for most fisheries the amount of overlap between each survey swath and the area actively fished is very limited. The fishers within the Victorian Giant Crab Fishery are potentially the most impacted due to their relatively small area of operation, however as described in the response to Comment 4, this impact is also expected to be limited. Further, with adequate advance notification of activities by Spectrum, on-water communications between vessels, and the reasonable assumption that fishing gear including giant crab pots are satisfactorily marked so that they can be readily spotted at sea by the support vessel located ahead of the seismic vessel, it is unlikely that fishing equipment will be accidently damaged or lost as a consequence of survey activities. Nevertheless, Spectrum appreciates the impact that such an event may have on fishing activities and agrees to compensate the rightful owner of equipment lost or damaged as a consequence of survey activities, along with associated loss of catch for the fishing trip in which loss or damage occurred (provided that this has been adequately substantiated). It is also noted that compensation for loss of catch due to displacement is inherently difficult because it requires assessment of potential against realised catch, based on records demonstrating displacement had indeed occurred as a consequence of the MSS. Therefore, given the low percentage of overlap with fishing areas and capacity for fishers to target other areas for the short duration of this overlap, Spectrum believes that it is not reasonable to consider compensation for potential displacement from fishing areas. Please note that Spectrum will consider providing SIV with a full copy of the EP once it has been approved by NOPSEMA. Until that time it is not appropriate to do so due to the likelihood of change. Spectrum maintains the previously expressed view that the survey area has minimal overlap with rock lobster habitat (122 km2; or 0.8% of the area of the fishery within the Warrnambool Region), will only be acquiring data in that area for a total of four days, and will have minimal impact on rock lobster adult and larval stages. As such, contribution to rock lobster reef re-seeding is not justified in this instance. SIV is considered a relevant persona and will continue to be consulted with regarding the proposed Otway Deep MSS.
	08/04/19	Email outgoing			Via email outgoing 08/04/19: Spectrum sent an additional email to SIV to address outstanding claims/objections from consultation report received 19/12/18. Responses to Part 2 of SIV's 19/12/19 report: With respect to the concerns that SIV have for displaced fishers and reduced economic activities in the Western Zone Rock Lobster Fishery, Spectrum have conducted the following analysis to assess the merit of this claim: Total catch of rock lobster in the Western Zone ranged from 209 to 261 t (average 237 t) for the period 2010/11 to 2016/17 (https://vfa.vic.gov.au/commercial-fishing/commercial-fish-production#fp-srl-year, accessed 14 Feb 2019). No catch data for this period is available for the area of the active fishery located within the survey

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					area due to confidentiality limits ([redacted], Principal Policy Analyst, VFA 12 Feb 2019). However, based on the proportion of rock lobster habitat that may be ensonified by seismic sound during the survey (0.8%), catches within this area may have averaged around 2 t during this 2010/11 – 2016/17 period. Catches across the Western Zone in the earlier three year period (2007/8 – 2009/10) ranged from 587 – 685 t (average 263 t). This is the most recent period in which sufficient vessels recorded catches from within the ensonified area to allow publication of this data, which indicates that between 6.3 and 10.6 t (average 8 t) were taken from the area of rock lobster habitat that may be ensonified by seismic sound during the survey. This equates to approximately 3% of the total catch taken at that time. It is noted that historic catches within the larger operational area represent a larger proportion of the total catch for the fishery, i.e. 130 tonnes for the period 2008 to 2017 (refer to SETFIA report in Appendix I). This is further discussed in Section 6.3 as it is associated with physical interaction within other marine users (e.g. potential for displacement). As such, Spectrum is of the opinion that the impact is small relative to the spatial and temporal extent of the fishery and the controls that Spectrum has implemented (Refer to Appendix G) have reduced the risks and impacts to the SRL fishery to as low as reasonably practicable. For the claim that the survey will impact RL larvae and subsequent recruitment into the fishery, Spectrum have conducted the following analysis to assess the merit of this claim: Day et al. (2016) exposed egg-bearing female spiny lobsters (Jasus edwardsii) to noise from three air gun configurations, all of which exceeded levels of 209 dB re 1 µPa (Lpk-pk). Overall there were no differences in the quantity or quality of hatched larvae, indicating that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure. Although no apparent morphological abnormalities were observed, exposed larvae from the 45 in3 experiment were found to be significantly longer than control larvae. However, the size of larvae in this study fell well within the range of natural variation, indicating natural variation in larvae is much greater that the differences observed between treatments in this study. Day et al. (2016a) concluded no effects on embryos early in development within 1 to 1.5 km of the seismic source. Based on the underwater sound modelling for the Otway Deep MSS, the predicted ensonified area within which received sound levels exceed Popper et al.'s (2014) mortality or mortal injury threshold for fish eggs and larvae is restricted to a distance of 110 m from the source through the water column and 166 m from the source at the seabed. In consideration of the spatial and temporal extent of this predicted impact it is also important to consider the following: Any plankton, including fish eggs and larvae, present in the water column within the survey area will not be evenly distributed, and are likely to exhibit substantial spatial patchiness and will be moving with the currents in the area; The seismic source will be constantly moving, and plankton populations are constantly being replenished by currents from non-impacted areas. Plankton populations' recover quickly due to their fast growth rates, and the dispersal and mixing of plankton from both inside and outside of the impacted area. Any mortality or mortal injury effects to fish eggs and larvae resulting from seismic noise emissions are likely to be inconsequential compared to natural mortality rates of fish eggs and larvae, which are very high (exceeding 50% per day in some species and commonly exceeding 10% per day). For example, in a review of mortality estimates (Houde and Zastrow 1993), the mean mortality rate for marine fish larvae was M = 0.24, a rate equivalent to a loss of 21.3% per day. From this assessment, predicted impacts are localised (within the 110-166 m from the source), and short-term based on estimated recovery times (days). These potential impacts are not significant when compared to rates of natural mortality in planktonic populations (10 – 50% per day), and impacts are not expected at a regional scale, based on the survey area plus 166 m buffer comprising 0.56% of the South-east Marine Bioregion. An FRDC report by Bruce et al (1996) shows that phyllosoma are very broadly distributed throughout the shelf and offshore waters of southern Australia and at very low densities, generally about 3-30 individuals per 1000 cubic meters when detected. However, many sampling sites did not detect the presence of any phyllosoma. If there is an impact, and there isn't any research to suggest there is, within a few meters of the

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					seismic source, the loss of larvae would be extremely small relative to the broader cohort of phyllosoma distributed throughout nearshore and offshore waters. Spectrum is of the opinion that the risks and impact to RL larvae and recruitment is small relative to the extent larvae distributed broadly within and adjacent to the greater fishery and in relation to natural mortality. Further, the density of larvae within 110-166m from the source is expected to be low. the controls that Spectrum has implemented (refer to Appendix G) have reduced the risks and impacts to the SRL fishery to as low as reasonably practicable. An assessment of the scientific evidence provided above assess the merit of the claim made by SIV. For the claim that the displacement of fishers will add pressure to other fisher/area and increase the number of impacted persons, Spectrum has undertaken a spatial and temporal analysis of the Commonwealth and state fisheries potentially active in the operational area (see Appendix G) From the data, It is evident that displacement is likely to be very small and as such it would be expected that pressure on other fisheries and areas is also likely to be very small. Therefore, further reduction of the survey spatially and temporally is unlikely to have measurable benefits for the fishery, but would compromise the commercial viability of the survey. Therefore, impacts to fishers through displacement have been reduced to as low as reasonably practicable. An assessment of the scientific evidence provided above assess the merit of the claim made by SIV. For the claim that the MSS will adversely impact larvae in Bonney Upwelling. The Bonney Coast is an area of known high primary productivity during periods of upwelling, however it lies 24.5 km from the survey area at its closest point and is therefore outside of the predicted area of ensonification for effects on plankton from seismic sound. The scientific evidence provided above assess the merit of the claim made by SIV. Furthermore, the impacts on larvae of fisheries species have been reduced to as low as reasonably practicable because further controls are not expected to further reduce the impact. For the claim that the MSS will have an adverse impact on physical injury to squid and their planktonic food source. Squid: McCauley et al. (2000) studied captive squid (Sepioteuthis australis) responses during a seismic survey, where squid showed a strong startle response to nearby air-gun start up and evidence that they would significantly alter their behaviour at an estimated 2 to 5 km from an approaching seismic source. Squid showed avoidance of the airgun by keeping close to the water surface at the cage end furthest from the airgun, appearing to make use of the sound shadow measured near the water surface (an almost 12 dB difference) (McCauley et al. (2000)). McCauley and Fewtrell (2012) studied the behavioural responses of squid to seismic sound levels. In general, squid displayed an increased frequency of alarm responses, particularly at higher sound levels, and increased swimming speed in the direction of the surface as the airgun approached and remaining relatively stationary near the water surface as the airgun signal became most intense. The authors again suggested that the squid detected the sound shadow (approximate 12 dB decrease in noise levels at the water's surface compared to the levels at depth), and therefore remained at the surface while the airgun signals were most intense (i.e. avoidance behaviour) (McCauley and Fewtrell 2012). This behaviour of becoming motionless is a common component of 'crypsis' in squid, and one that squid commonly exhibit when threatened (Smith, 1997). Plankton: McCauley *et al.* (2017) reported zooplankton mortality rates more than two orders of magnitude higher than recorded in earlier studies. They found that exposure to a 150 in3 airgun shot significantly decreased zooplankton abundance and that the mortality rate increased from a natural rate of 19% per day to 45% per day. Impacts were detected out to edge of the study area, at 1.2 km from the airgun in waters 34 to 36 m deep; these water depths are considerably shallower than the majority of seismic surveys in Australia. The independent reviews have been shared with the authors of the McCauley et al. (2017) paper, and those authors have concurred with many of the shortcomings in study design and evaluation identified by the independent reviewers (IAGC, 2017). The IAGC (2017) concluded that the results of McCauley et al. (2017) showing patterns and trends do not actually exist in the data. Further, the results presented by McCauley et al. (2017) are of questionable scientific merit and, accordingly, must be subjected to more rigorous scientific study before being accepted as the "best available science" regarding the potential effects of seismic sound on zooplankton. Existing published

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					studies demonstrating that any seismic effects on zooplankton occur only to tens of meters remain the best available science until the preliminary study by McCauley et al. (2017) can be properly replicated. Although the recent work by McCauley *et al.* (2017) and Richardson *et al.* (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. The evidence provided above is further detailed in the Environment Plan. From the best available research reviewed it is reasonably expected that squid and plankton will not be impacted at a population level. Squid are likely to respond behaviourally, while any impacts to plankton are likely to be temporary and recovery likely to be rapid. As such, the scientific evidence provided above assess the merit of the claim made by SIV. The controls implemented to mitigate impacts to the squid fishery to as low as reasonably practicable are detailed in Appendix D and impacts to plankton can't be reasonably reduced further. For the SIV concern that the MSS will have an adverse impact on finfish reproduction, Spectrum has conducted the following analysis to assess this concern. There are limited studies examining the effects of seismic surveys on finfish reproduction, spawning and aggregation to spawn. However, there are several studies that have examined the overall effect to finfish fisheries which may be used as a proxy for the overall effect on the fishery. As discussed in Section 6.1.4.3 of the EP (Appendix E), fish may avoid areas of seismic activity and fish schools may disperse or change feeding behaviour patterns. A potential consequence of this is fewer fish are attracted to baited traps or hooks, or target species may follow prey species away from the area during the survey, thereby resulting in a temporary reduction in the catchability of commercially valuable species. An example of this is provided by Wardle et al. (2001) who used a video camera to document the behaviour of fish in response to noise levels equivalent or greater than those in the proposed survey. This study showed that the resident fish on the site did not evade the active source until it was within a few metres. No direct mortality was observed at sound levels of up to 218 dB (Lpk). Nevertheless, some fishers have expressed a belief that there is indeed a longer-term effect on fish catchability or presence in fished areas. This is difficult to determine given the difficulty in separating possible seismic survey effects out from other factors such as fishing pressure, climatic changes and variation in natural population dynamics. A series of studies have been undertaken to determine the effects of seismic surveys on fish catches and distribution, primarily in the United States and Europe (e.g. California: Greene 1985, Pearson *et al.* 1992; Norway: Dalen and Knutsen 1987, Lokkeborg and Soldal 1993; and UK: Pickett *et al.* 1994). While the conclusions from these studies are largely ambiguous, due to the inherently high levels of variability in catch statistics, one study noted that pelagic species appear to disperse, resulting in a decrease in reported catches during the surveys (Dalen and Knutsen 1987). A study undertaken by the CSIRO and Geoscience Australia (Thomson et al. 2014) examined fisheries catches (ten species of interest) and catch rates for potential effects from 183 seismic surveys undertaken in the Gippsland Basin (Bass Strait). This study also found no clear or consistent relationships between seismic surveys and subsequent fisheries catch rates (Thomson et al. 2014). The scientific evidence provided above assess the merit of the claim made by SIV. Since previous studies have not found detrimental effects more broadly to finfish fisheries, it is reasonable to expect that reproduction is unlikely to be affected to an extent that it is detrimental to the sustainability of the fishery. The controls that have been adopted to reduce impacts to finfish fisheries to as low as reasonably practicable are detailed in Appendix D. For the SIV concern regarding McCauley et al. 2016 question of survivorship of Rock Lobster and Giant Crab in the wild following the MSS. SIV required control measures to mitigate the impact of seismic noise. To address this concern Spectrum undertook the following analysis. With respect to berried females in the ensonified area, the study by Day et al. (2016a) reported no effects on embryos early in development within 1 to 1.5 km of the seismic source. Furthermore, the period during which females carry the eggs prior to release occurs from June to August, which is outside of the survey period, and many females

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					will have released their eggs by the time the survey commences (i.e. hatching commences in September). However, hatching will continue to occur from October to November, i.e. at the time when the seismic survey is proposed, and so there is potential spatial and temporal overlap with rock lobster larval stages (nauplius and phyllosoma phases). The modelling predicts the spatial extent of ensonification would only extend 110 to 166 m from the source (EP Section 6.1.4.1.1; Appendix E) within the rock lobster habitat, i.e. <200 m water depth, and over a period of 4 days spread over 50 days duration. Recent studies have investigated the impact of seismic sound on lobster embryos (Day et al. 2016b) and reported that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure (Day et al. 2016b). Although Day et al. (2016a) reported sub-lethal effects in field experiments, the study also highlighted potential adaptation of lobsters to statocyst damage and no ensuing impairment to righting reflexes (Day et al. 2016a). Previous to this study, laboratory based studies did not find effects on righting (turnover rates), with no differences observed between control and exposed animals to levels from 202 to 227 dB re 1 µPa (Payne et al. 2007). Further, one of the few studies to explore the issue of the effects of seismic on catch rates for lobster found no statistically significant correlative link between seismic surveys and changes in commercial rock lobster (Panulirus cygnus) catch rates associated with acute to mid-term mortality over a 26-year period in western Victoria (Parry and Gason 2006). Given the small area of ensonification to levels that could cause sub-lethal effects and that the duration of exposure is limited to 4 days over a 50 day period, the impact of sub-lethal effects (i.e. impairment of reflexes, damage to statocysts and righting) on catch and catchability lobsters is considered to be minor. The scientific evidence provided above assess the merit of the claim made by SIV. As requested by SIV, Spectrum have adopted controls to reduce seismic impacts to southern rock lobster and giant crab as detailed in Appendix D. The residual impact to these fauna has been reduced to as low as reasonably practicable with the adoption of these controls. For the concern that the use of Day et. Al 2016 to define limited of sound exposure is queried and an independent review of the described impact buffer is requested, Spectrum has provided the following analysis. Spectrum have employed the thresholds developed by Day et al (2016) and the best available numerical modelling to predict the effect of the rock lobster fishery. This approach is best practice and given the potential small extent of the impacts indicated by the modelling, further review is not considered necessary. Received levels were predicted at the seabed for single shot (per-pulse) and compared with the maximum received level (209 dB re 1 µPa) recorded by Day et al. (2016a) that resulted in sub-lethal effects in lobsters. Sound modelling results for the Otway Deep MSS predicts potential for sub-lethal effects (no mortality) in lobsters between 175 and 260 m from the seismic source. These predicted distances are consistent with the distances measured by Day et al. (2016) (i.e. sub-lethal effects up to 166 to 232 m from the seismic source). The modelling predicts the spatial extent of ensonification would only extend 110 to 166 m from the source within the rock lobster habitat, i.e. <200 m water depth, and over a period of 4 days spread over 50 days duration. The scientific evidence provided above assess the merit of the claim made by SIV. This information has been used to adopt the controls outlined in Appendix D to reduce the risks to rock lobster to as low as reasonably practicable. For the SIV concern that November to January is the most important period of the year for spawning. Industry is concerned about the impact of seismic sound on reproduction, larvae and subsequent recruitment. Spectrum has provided the following analysis to address concern. The objection to conducting the survey during November-January due to spawning by most species is a very general claim which is difficult to give a specific response. However, impacts to a range of species have been assessed in the following table which is from the Environment Plan (see Appendix G). The scientific evidence provided above assess the merit of the claim made by SIV. This information has been used to adopt the controls outlined in Appendix D to reduce the risks to rock lobster to as low as reasonably practicable. For the SIV concern that the use of data by Richardson et al. 2017 in the EP is not directly relevant to Otway. Further, the cumulative impacts of seismic sound due to

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					other proposed MSS must be considered in the impact. Spectrum has conducted the following assessment to address this concern. Spectrum have addressed the concerns relating generally to larval impacts and reproduction in response to concerns outlined above. Although the study by Richardson et al (2017) was conducted on the North West Shelf, it does not change the fact plankton have rapid rates of turnover. Their work uses plankton densities and metocean conditions found at the North West Shelf Bioregion, but the model used to estimate plankton population turnover is not location specific and could be applied generally to plankton. Further, the study states that seismic surveys that occur off the shelf edge and in offshore waters, such as most of the Otway Deep survey, are likely to have less impact due to lower plankton densities found offshore. The 3D Oil Dorrigo study has been considered in the impact assessment of the EP and controls have been adopted as outlined in Appendix D. The statement that there will be "significant and alarming potential that any denuding from the Otway Deep MSS" survey is unsubstantiated. Richardson et al (2017) clearly outlines the failings of the McCauley et al (2017) study into seismic impacts on plankton and states the majority of research has only shown effects from seismic noise on plankton within 10m of the source For the SIV concern that Spectrum should undertake a regional study to quantify spatial/temporal impacts including water column testing for eggs/larvae of commercial species the following analysis has been conducted. The request to improve understanding of temporal and impacts on eggs and larvae is not a simple undertaking nor is there much certainty that the study would achieve the objective. The cost, time and logistics of collecting sufficient amounts of data that could account for the inherently very large variability of such a system would take many years and millions of dollars and may still not yield meaningful results. If a study is as simple as suggested, it is difficult to understand why fisheries scientists have not already conducted such a study to better understand the population dynamics of target species. With the current level of scientific knowledge suggesting the risk of impacts is likely to be low, the cost and risk (of not obtaining meaningful results) of the suggested survey is grossly disproportionate to the potential gain and is therefore not considered ALARP. For the SIV concern that Spectrum must remove all potential Rock Lobster habitat (<150 m) from survey and discuss compensation (with SIV) for displaced fishers and consider contributing to upcoming RL re-seeding program. Spectrum has conducted the following analysis to address the concern. The best available scientific research which exposed adult and buried rock lobster to seismic noise did not find any evidence of mortality, stress, or ongoing effects to larval fitness (Day et al 2016) (it only found impacts on statocyst tissues). In addition, the scientific uncertainty of impacts to rock lobster is likely to be very low and the survey overlaps with very little of the greater rock lobster fishery. The regulations state that ALARP has been demonstrated/achieved once the cost of further management controls are grossly disproportionate the benefit gained by their implementation. The best available science shows there is likely to be minimal impacts to rock lobster with the current control regime and the mitigation measures suggested above by SIV are extremely expensive and not founded on any evidence that impacts to rock lobster will be reduced. Therefore, Spectrum considers that the cost of the measures proposed by SIV are grossly disproportionate to the benefit gained. For the SIV Concern that Spectrum must remove all potential giant crab habitat (<150 m) from survey and discuss compensation (with SIV) for displaced fishers. Spectrum has conducted the following analysis. Sound modelling results for the Otway Deep MSS predicts potential for sub-lethal effects (no mortality) in giant crabs between 175 and 260 m from the seismic source (refer to EP Table 6.9 in Response to item #3 above) based on the Day et al. (2016a) effect threshold (209 dB re 1µPa (peak to peak)) for lobsters and applied to giant crab as a proxy for crustacean species (recommended by the study authors). This is a conservative threshold based on previous species specific studies that have investigated the effect of seismic on crab species and have not recorded mortality or stress bioindicators or avoidance behaviour. No evidence of mortality-associated population effects such as reduced abundance or catch rates were reported in snow crabs up to 12 days after exposure to received levels of 224 dB re 1 µPa (peak) (Christian et al. 2003). This same study also found no stress bioindicators in snow crabs (Christian et al. 2003; Christian et al. 2004).

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					Furthermore, the survey vessel will only be acquiring data in water depths of 400 m or less for a total of eight days for the entire survey season (inclusive of line turns and with part days rounded to full days), including 2, 4, 1 and 1 days in Swaths 1 to 4, respectively (Swath 5 does not extend into waters less than 400 m; Table 6.9). Given the maximum biological depth range of this species (<400 m), this is the maximum duration that fishable biomass would be exposed to sound levels that may cause sub-lethal effects. Sound avoidance behaviours could have a more longer term impact on populations, particularly if animals migrate out of an area in which seismic surveys are conducted. However, the study by Christian et al. (2003) found that snow crabs did not move to avoid low-frequency sounds. In a more recent study, Morris et al. (2018) concluded no effect on snow crab fishery catch rates in the short (days) or longer term (weeks) following a seismic survey over the continental slope. Avoidance, and therefore changes in catchability of giant crab by fishers is therefore not expected during the survey. The regulations state that ALARP has been demonstrated/achieved once the cost of further management controls are grossly disproportionate the benefit gained by their implementation. The best available science shows there is likely to be minimal impacts to giant crab with the current control regime and the mitigation measures suggested above by SIV are extremely expensive and not founded on any evidence that impacts to giant crab will be reduced. For the SIV concern that placing 15% of Rock Lobster biomass at risk threatens the value of the Rock Lobster Fishery. It is also claimed that the TACC has halved since seismic activities started in the Otway Basin. Spectrum has conducted the following analysis to address the concern. Spectrum, respectfully, does not consider the anecdotal observation of “As a measure of impact Western Zone Rock Lobster Total Allowable Catch (TACC) halved since heavy seismic activities in the Otway Basin in the past decades” as evidence that seismic activity has impacted the Western Rock Lobster fishery given a) the inherent large natural variability in stock changes through time, b) the effects fishing has on stocks and c) no detailed scientific evidence to support this claim. Rather, Spectrum have researched the best available scientific literature that systematically aims to determine cause and effect of seismic exposure on southern rock lobster. The Day et al. (2016) study is the most recent that has recorded negative effects on commercially important shellfish species from seismic sound. The study investigated the effects of seismic sound on southern rock lobsters (Jasus edwardsii). Rock lobster experiments consisted of four sampling times between days 0 and 120 post-exposure, as well as over the longer term of 365 days post-exposure. Each lobster experiment comprised two treatments; a control pass of the airgun where it was deployed but not operated, and an active pass of the airgun (Day et al. 2016). Following exposure, a total of 302 lobsters, were sampled and assessed for mortality, two behavioural reflex tests, statocyst damage (balance and gravity sensing organ), condition, haemolymph biochemistry, the number of circulating haemocytes and embryonic development (see EP Section 6.2.4.1.1 (Appendix E) for a description of results on lobster larvae). The maximum measured exposures were 209 to 212 dB re 1 µPa Lpk-pk. The maximum cumulative SEL received from multiple shots was between 192 and 199 dB re 1 µPa2.s (Day *et al.* 2016). The study found that exposure to seismic sound levels up to a maximum SEL of 209 to 212 dB re 1 µPa Lpk-pk did not result in mortality of any adult lobsters, even at close proximity. The scientific evidence provided above assess the merit of the claim made by SIV and Spectrum does not agree with the claim in light of the scientific evidence.
	08/04/19	Email outgoing			Via email outgoing 08/04/19: Spectrum followed up on an email regarding CarbonNet data. Spectrum communicated that Spectrum is unable to obtain the results from the CarbonNet verification study, however have been able to obtain the findings of a study PGS has previously undertaken sound source verification (SSV) for the 3260 in3 array during operations within New Zealand to assess for compliance with the mitigation zones outlined in the New Zealand Code of Conduct (short-range modelling). The verification process utilised recorded seismic data from the survey to confirm that actual emitted sound levels were as per predicted levels (G. Bennett, 2017). The analysis found that the received levels were less than the levels modelled in the sound transmission loss modelling report. The sound modelling was performed by SLR Consulting Australia Pty Ltd, and the sound verification was performed by Talis Consultants (G. Bennett, 2017). The sound propagation and attenuation are expected to be similar because the sound modelling

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					undertaken by JASCO has utilised conservative assumptions to allow for variables that may introduce variation in sound attenuation
		Ongoing consultation: Spectrum will continue to provide project updates to SIV and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
South Australian Rock Lobster Advisory Council Inc (SARLAC) [redacted]	09/02/18 27/02/18 01/06/18 04/07/18 04/07/18 05/07/18 06/07/18 06/07/18 09/07/18 09/07/18 09/07/18	1st formal notification 1A General 1st formal notification 1A General 2nd formal notification 2C Fisheries Phone call outgoing Phone call incoming Phone call outgoing Phone call incoming Phone call outgoing Phone call outgoing Phone call incoming Email outgoing	No feedback received in response to the first stakeholder consultation letter. Via phone calls 04/07/18, 05/07/18 and 06/07/18: Missed phone calls and voicemails. Via phone call outgoing 09/07/18: Spectrum phoned, and representative [redacted] advised he passes any information received directly on to association members, so all members of SARLAC and SEPFA have received the consultation packages. Relayed comments passed on from fishermen including concerns surrounding seismic impacts on lobster stocks and the concerns raised within the McCauley paper regarding seismic noise impacts on plankton. He stated that all queries raised by their members have been passed directly onto Southern Rock Lobster Limited (SRL), who are compiling the responses of three states (VIC, TAS and SA) into a report to Spectrum by the end of the month.	SARLAC stated that their members are generally concerned about seismic impacts on rock lobster stocks and the outcomes of the McCauley paper. SARLAC's concerns raised regarding noise impacts on rock lobsters are merited due to potential for survey to affect rock lobster stock for fishers. Spectrum have provided information to SARLAC (01/06/18) that addresses these concerns about rock lobster, and SARLAC stated they forward everything to their members. No further action.	Via email outgoing 09/07/18: Spectrum followed phone call up with an email and asked if he would forward members concerns to Spectrum, so they could be addressed. No response received. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd Formal notification 3A General	No feedback has been received in response to the 3rd formal notification sent to SARLAC on the 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	21/03/19	Email outgoing	No feedback has been received in response to the email outgoing sent to SARLAC on 21st March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to SARLAC's feedback (once received) to the email sent 21/03/19 in ongoing consultation	Via email outgoing 21/03/19: In response to SARLAC's concerns surrounding McCauley et al. (2017) paper regarding seismic noise impacts on plankton raised in a phone call on the 9th July 2017, Spectrum provided SARLAC with a summary of the impact assessment relating to impacts on plankton (incl, fish larvae and eggs) and spawning, and impacts to spawning including reference to the McCauley et al. 2017 paper. Impacts to plankton (incl. fish larvae and eggs) and spawning The potential impacts of seismic surveys on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the airgun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to diel migration of plankton (including fish larvae) between surface and deep waters. Consequently, predicting impacts is difficult due not only to the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey. Although the recent work by McCauley et al. (2017) and Richardson et al. (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. Impacts to spawning The potential mortality of larval fish that rely on zooplankton for food is difficult to predict but is not expected to affect a significant proportion of larvae based on the assumption that not all zooplankton are killed by exposure to airguns (around 22% to 35%, depending on ocean circulation; Richardson et al. 2017), only a very small proportion of the plankton would be exposed at any one time, and that zooplankton populations are likely to begin to recover rapidly following completion of a seismic survey due to fast

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					growth rates, combined with dispersal and mixing of zooplankton from both within and without the area of effect. Richardson et al. (2017) showed that zooplankton communities can begin to recover during the survey period during periods of good oceanic circulation (and periods of upwelling), and therefore a continuous decline is zooplankton throughout the survey period is not anticipated and parts of the survey are would progressively recover during the survey. It is unlikely there would be localised patches of reduced food availability for plankton feeders over the period of the survey and during the 3-day recovery period (as modelled by Richardson et al. (2017)). No population level effects are expected in commercially caught finfish species, or to their catch rates as an indirect result of impacts on eggs/larvae. Based on the results of the modelling and research thresholds, impacts to these species, particularly at the population level, is expected to be negligible. A control is in place on survey operations to avoid surveying waters shallower than 500 m depth after the start of December to reduce impacts on spawning.
		Ongoing consultation: Spectrum will continue to provide project updates to SARLAC and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
South Australian Sardine Industry Association (SASIA)	27/02/18 01/06/18 1/02/19	1st formal notification 1A General 2nd formal notification 2C Fisheries 3rd Formal notification 3A General	No feedback or response received in response to the 1s, 2nd and 3rd formal notifications sent to SASIA on the 27th February and 1st June 2018 and 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to SASIA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
South East Trawl Fishing Industry Association (SETFIA) [redacted] who also represents: Southern Shark Industry Alliance (SSIA) and Small Pelagic Fishery Industry Association (SPFA)	09/02/18 29/03/18 03/04/18 03/04/18 03/04/18 03/04/18 03/04/18 04/04/18 04/04/18 04/04/18 05/04/18 05/04/18 05/04/18 05/04/18 06/04/18 06/04/18	1st formal notification 1A General Phone call outgoing Email outgoing Email incoming Email outgoing Email incoming Email outgoing Email incoming Email outgoing Email incoming Email outgoing Email incoming Email incoming Email incoming Email incoming Email incoming	No feedback received in response to the first stakeholder consultation letter. Via email 03/04/18: In response to Spectrum's interest in meeting in Melbourne, [redacted] advised that he was unable to meet in Melbourne but happy to meet in Lakes Entrance and would require data about who fishes where and to what extent for a meeting to be meaningful. Via email 03/04/18: [redacted] replied with an indication of his availability and requested information on shark, scallop, trawl and SPF ahead of the meeting. Via remaining emails 03/04/18 to 04/04/18: FLO liaised with [redacted] about having a conference call with Spectrum on 05/04/18. Via email 05/04/18: [redacted] thanked FLO for the maps. He asked if it was ABARES data and asked about GHaT gillnet and auto line. Stated that SPF wouldn't be an issue, but it looked like the area was important for trawl. Via email 05/04/18: [redacted] emailed FLO to defer the conference call to the next day. Via remaining emails 05/04/18 to 06/04/18: FLO liaised with [redacted] about having a conference call with Spectrum on 06/04/18.	Spectrum and [redacted] were liaising on meeting to discuss the proposal. [redacted] requested information on shark, scallop, trawl and SPF ahead of the meeting. The request for information in merited due to [redacted] role as a representative for SETFIA, SSIA and SPFA who represent fishers that may be impacted by the survey.	Via phone call 29/03/18: FLO phoned representative of SETFIA, SSIA and SPFA [redacted] to introduce himself and discuss the proposal. No answer. Via email 03/04/18: FLO followed up the phone call on 29/03/18 stating that Spectrum would like to meet with [redacted] in Melbourne and asked about his availability. FLO attached another copy of the first stakeholder consultation letter. Via email 03/04/18: In response to [redacted] reply the FLO stated he would be in touch to organise the meeting. Via remaining emails 03/04/18 to 04/04/18: FLO liaised with [redacted] about having a conference call with Spectrum on 05/04/18. FLO provided [redacted] with series of high-resolution maps for review prior to the meeting. Via remaining emails 05/04/18 to 06/04/18: FLO liaised with [redacted] about having a conference call with Spectrum on 06/04/18.
	06/04/18 06/04/18	Conference call Email incoming	Phone conference 06/04/18 (Spectrum, FLO and [redacted]) and follow-up email: [redacted] advised that he represents multiple industry associations for Commonwealth fisheries including: SESSF GHAT Commonwealth Trawl Sector SESSF GHAT Shark Hook Sector SESSF GHAT Gillnet Sector Small Pelagic Fishery.	No objections or claims, however [redacted] expressed concerns about the location of OBNs. Action: Spectrum to provide further information on the location of OBNs. Action: Spectrum to provide catch and effort data from AFMA to Simon. Action: Spectrum to review the notification recommendations and consider for inclusion in the EP.	Phone conference 06/04/18 (Spectrum, FLO and [redacted]): Spectrum welcomed the advice and recommendations made by [redacted]. Spectrum subsequently provided information to [redacted] (refer to 01/06/18) evidencing that they have committed to locating the OBNs in non-trawled areas, and this control measure is included in this EP. Spectrum requested the catch data from AFMA on 09/04/18 (refer to AFMA consultation in this table) but were advised that no such data could be provided. Spectrum therefore undertook an exhaustive search for publicly available information on fishing catch and effort relevant to [redacted] functions, interests and activities. All catch and effort data available from fisheries authorities was collected and provided to

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			Advised that to reduce impacts to the fishing industry, they would need data on the catches by month for the four fisheries above for the previous 10 years. Stated that the ABARES data is too coarse as trawl operations are conducted with a 10 m precision level and that AFMA would be able to supply high-resolution aggregated catch data. [redacted] recommended using the larger footprint that includes turning circles to assess impacts. Expressed concern about the placement of OBNs, and offered to assist in the positioning of the bocks which are to be deployed shallower than 1,200m. [redacted] welcomed the opportunity to access bathymetric data, stating it as a small but welcome offset to any effect on the fishing industry. [redacted] stated that they consider it normal practice to use SMS messaging to warn, move and update affected fishers. They recommend an SMS warning at 6 months, 3 months, 2 months, 1 month, 3-2-1 weeks and then during the survey. He offered services for stakeholder engagement and notification for a fee.		[redacted]. Spectrum continued to seek information via ongoing consultation with fisheries associations and fishers. Spectrum reviewed the notification recommendations and developed a notification schedule for the activity, which includes notifying commercial fishers before the survey begins at 4 weeks, 7-10 days and daily during the survey. Control measures related to notifications to fishers were included in the second stakeholder consultation letter sent on 01/06/18 (covered below).
	03/05/18 04/05/18	Email incoming Email outgoing	Via email 03/05/18: [redacted] followed up on his email 06/04/18 and reiterated that he required data from Spectrum to inform a discussion on the impacts of the survey and requested information on potential impacts to SPF, Eastern Zone Rock Lobster, SETF and GHaT fisheries as a matter of urgency. He restated his belief that a six-month notification is required by fishers and stated that the associations he represents consider it unreasonable to propose to run the survey as early as October. He stated that Spectrum had not yet sent him the proposed locations of the OBNs. Requested that his email be included in the EP.	[redacted] requested data and recommended a notification schedule. The request for information in merited due to [redacted] role as a representative for SETFIA, SSIA and SPFA who represent fishers that may be impacted by the survey. Action: Spectrum to provide catch and effort data and proposed OBN locations to [redacted]. Spectrum have already addressed [redacted] concerns about notifications to stakeholders (see row above). No further action required.	Via email 04/05/18: Spectrum replied to [redacted] email stating they had received the finalised underwater sound modelling results and had obtained additional fisheries catch and effort data (since the AFMA could not provide it). Spectrum stated they would provide the data to him, and that he would receive a summary of the EP impact assessment. They stated they would respond to his concerns as soon as possible and confirmed that his email would be included in the consultation records provided to NOPSEMA. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Spectrum appreciates SETFIA's concerns for the fisheries and as such has conducted a risk and impact assessment using the best available science which has been used to develop mitigation controls. This is summarised below and is further detailed in Stakeholder consultation R3 Fisheries. Effects of seismic on the following fisheries Area of survey overlap with finfish fisheries: Small Pelagic Fishery (SPF) 0.67% overlap within survey area Southern and Eastern Trawl Fishery (SETF) 2.01% overlap within survey area Gillnet Hook and Trap Fishery (GHaT) 1.69% overlap within survey area Predicted impact on finfish fisheries: the impacts on fish species within the survey area as a consequence of seismic activity are mainly expected to be behavioural. These are likely to be temporary as the seismic vessel transverses each survey line, localised in spatial extent, and most relevant to continental slope habitat which comprises only a small part of the overall survey area. Behavioural responses are more likely to result in changes in diel movements (vertical) rather than horizontal movements, and it is unlikely that fish will be displaced from the survey are, particularly give the area will not be permanently ensonified for the whole duration of the survey. This is because the survey vessel will transverse sail lines starting inshore and moving offshore, with each subsequent sail line being between 8 and 12km away from the preceding line. Fish exposed to received sound levels eliciting a behavioural response will therefore recover between sail lines Area of survey overlap with Southern Rock Lobster fishery: Victorian Southern Rock Lobster Fishery 14.92% within survey area Tasmanian Southern Rock Lobster Fishery <1% within survey area. Predicted impact on Southern Rock Lobster fishery: There is no spatial overlap between the lobster habitat and the area that will be ensonified at levels above those which have been shown to affect lobsters. Spawning generally occurs in waters shallower than where the survey will occur with larval dispersal occurring over a very large spatial area. As a result of the factors described above, the survey is extremely unlikely to have effects on lobsters, the catch or their recruitment into the fishery.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Proposed control measures to minimise disruption to fisheries: Proposed control measures to minimise disruption to fisheries through exclusion zones include reductions in the survey plans to avoid where possible overlap with key habitats along the continental slope. In addition, the following management measures are proposed to avoid long-term (> 1 month) displacement of fishers and avoid potential conflict with fishing activities or loss of fishing equipment Spectrum will notify all relevant persons 4 weeks prior to the start of the survey of the survey details including timing, location and duration Fishers actively operating in the survey area will be issues a 7 to 10 day forecast prior to activities commencing in the survey area, and will be kept informed of daily survey activities through Spectrum's 24-hour look-ahead communication process. Spectrum will continue to advise relevant fishers of planned sail-lines and dates and if any issues are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflicts. Controls to be considered will include: Moving to another sail line Deviating around fishing activity area by 3km Allowing fishers to fish area prior to seismic acquisition Minimise survey activity areas where there is known fishing activity Long-term displacement of fishers will be avoided by ensuring that each cluster of surveys ('racetrack') is completed within one month A support vessel will accompany the survey vessel and manage interactions with other marine users' vessels transiting near the seismic vessel or streamers.
	01/06/18 06/06/18 08/06/18 08/06/18	2nd formal notification 2E SIV/TSIC Email incoming Email incoming Email outgoing	Via email 08/06/18: In response to the second stakeholder consultation letter, [redacted] reiterated that Spectrum seek data to understand what fisheries might be affected and to what extent. He stated that SETFIA made a proposal to complete this work and could have provided this data by mid-April. He noted that Spectrum engaged [redacted], which is excellent but that he has yet to see the data despite repeated requests. He provided feedback on a meeting with 3D Oil and that they discussed how the survey effects near King Island might be reduced. He noted that there are several proposals on the table that 3D will consider and that if they make some concessions SETFIA may even give their survey the group's blessing. He stated that without the data requested, that the associations he represents object to Spectrum's proposal until its effects and potential control measures are understood. He requested the fisheries data again and asked that Spectrum contact them and that none of the information provided on 01/06/18 helps reduce the impacts of the survey.	[redacted] stated that the associations he represents object to the survey until the impacts and control measures were understood. The letter provided on 01/06/18 did include the information [redacted] requested, therefore Spectrum have addressed his request for information. No further action.	Via email 01/06/18: Spectrum provided [redacted] with the second stakeholder consultation letter. The letter contained a summary of the Otway Deep MSS EP impact assessment for fisheries, summarising the existing literature, data and information on the relevant fisheries, the potential impacts identified, and the control measures proposed to mitigate them. Via email 08/06/18: Spectrum thanked [redacted] for his feedback and ongoing engagement, and stated that while they recognise the potential for conflict between industries operating in the same waters, they are committed to minimising and mitigating impacts from their activities on other users. Spectrum stated that they have used all publicly available information to identify contact details for all individual licence holders that could be affected by the survey, including appointing a fisheries liaison officer to identify these fishers. Spectrum is drafting a response to address concerns on the fisheries that may be affected by the survey. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Spectrum appreciates SETFIA's concern in relation to the effectiveness of the controls to mitigate the risks of the survey on the relevant fisheries. However, the controls to be employed during this survey are standard industry controls and are informed by the best available science and numerical modelling. To not proceed with the activity based on the low level of uncertainty associated with the controls would be inconsistent with the regulatory requirements of reducing risks and impacts to ALARP and Acceptable levels.
	22/06/18 24/06/18 25/06/18 26/06/18 26/06/18 26/06/18	Email incoming Email outgoing Email incoming Email incoming Email outgoing Email outgoing	Via email 22/06/18: [redacted] emailed Spectrum with a proposal to develop a report that would guide the process of trying to minimise the effects of the survey on commercial fishing activities. Asked about Spectrum attending meetings with 3D Oil and stakeholders at King Island. Most fishermen on King Island are cray fishermen, and although the survey may be deeper than they operate, he suggests attendance at the meetings would still be worthwhile. [redacted] also suggested some the addition of a deepwater line and the Zeehan Commonwealth Marine Park to the maps Spectrum had developed, to assist with consultation.	No objections or claims.	Via emails 24/06/18 and 25/06/18: Spectrum accepted [redacted] proposal, and stated that they would be attending the Portland trip and would consider whether the King Island trip would be relevant. Spectrum also requested certain clarifications regarding the proposal. Via emails 26/06/18: Spectrum emailed with clarification of the scope of the report to cover the Activity EMBA, comprising the OBN deployment area, ensonification area and areas covered by vessel line turns.
	02/07/18	Email incoming	Via email 02/07/18:	No objections or claims.	NA.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			[redacted] provided Spectrum with list of the fisheries that can operate in the survey area and a current list of SETFIA stakeholders for those fisheries, including contact details.		
	11/07/18	Email incoming	Via email 11/078/18: [redacted] emailed to notify oil and gas stakeholders that their Fishery Independent Survey was not going ahead this year and was on hold.	No objections or claims.	NA.
	13/07/18 13/07/18 18/07/18 18/07/18 18/07/18 24/07/18 01/08/18	Email outgoing Email incoming Email incoming Email outgoing Email incoming Email incoming Emails incoming (x2)	Via email 13/07/18: RPS requested AFMA data aggregated by month to address NOPSEMA comments on the draft EP. [redacted] acknowledged the request (13/07/18) and provided all Commonwealth fisheries data for the OBN area to Spectrum on 18/07/18. Via email 24/07/18: Data update. Via emails 01/08/18: SETFIA emails to submit their draft report covering SA, VIC and the Commonwealth, with Tasmania still to come. SETFIA also acknowledged the trimming of the south-eastern boundary of the survey area.	No objections or claims.	NA.
	15/08/18	Email incoming	Via email 15/08/18: [redacted] emailed coordinates of new locations for two of the OBNs that had been agreed in consultation with other stakeholders. Two OBNs will be relocated in response to stakeholder feedback.	No objections or claims.	Spectrum revised the location of the two OBNs in response to stakeholder feedback and other stakeholder feedback and the new locations have been updated in this EP.
	03/09/18	Email incoming	Via email 03/09/18: [redacted] submitted SETFIAs final report.	No objections or claims.	NA.
	17/09/18 19/09/18 10/10/18 15/10/18	Email outgoing Email incoming Email outgoing Email incoming	Via email outgoing 17/09/18: Spectrum contacted [redacted] with a query about the following statement about SQO SFR holders in his report; “there were only seven active vessels out of 64 concessions”. Spectrum noted that AFMA data states there are only 36 SQO SFR holders for the SSJF and asked for clarification. Via email 19/09/18: [redacted] responded that there was an error and the correct number is 36. Spectrum confirmed that once that change was made they were happy to accept the finalised report (10/10/18). Via email 15/10/18: [redacted] forwarded an updated version of the final report with the number of SQO SFR holders corrected.	No objections or claims.	A copy of the final report is included in Appendix I of this EP. [redacted] is considered a relevant stakeholder and Spectrum will continue to consult with him as part of the ongoing consultation process.
	01/02/19 06/02/19 11/02/19 11/02/19 11/02/19 12/02/19 12/02/19 12/02/19 12/02/19 12/02/19 12/02/19 14/02/19	3rd formal notification 3A General Email incoming Email outgoing Email incoming Email outgoing Email incoming Email outgoing Email outgoing Email outgoing Email incoming Email outgoing Email incoming	Via email incoming 06/02/19: [redacted] enquired with Spectrum as to whether Spectrum would like him to send an update to the western fleet.[redacted] stated he is able to send the update however is unable to send the 3 timing options. Requested Spectrum provide him with ideas/desires as to what should be sent to the western fleet. Via email incoming 11/02/19: [redacted] stated that an SMS service had already been paid for by Spectrum but asked whether required a description of what they had paid for. [redacted] stated that following another potentially bad debt from the oil/gas sector and continual disputes over invoices and payment with the same oil/gas company, SETFIA’s board have instructed Simon to report back on whether the work SETFIA is undertaking in this space is contracted by executed and active contracts or POs. Spectrum have paid and this is a secure as it can get so there will be no issue. SETFIA has stopped work on ad-hoc agreements with other oil/gas companies until the work is more protected. [redacted] stated that he is unable to send the attachments as SMS. However, he is able to link the SETFIA Facebook page in the SMS where the information will be accessible by members. However this requires a link to Spectrum’s website or text that [redacted] is able to	[redacted] request for guidance on what Spectrum would like to be distributed is merited. Merited as the information was to be distributed to many stakeholders impacted by the survey and therefore important to be correct. [redacted] request for a link to the website or text to post to the SETFIA Facebook page is merited.	Via 3rd formal notification 01/02/19: Spectrum provided [redacted] with a copy of the 3rd formal notification sent to stakeholders on the 1st February 2019. Via email outgoing 11/02/19: Spectrum requests for [redacted] to send the attachment (3rd formal notification 3A General) to his SETFIA members, so as to not lose anything in translation. Spectrum requested if [redacted] was able to determine if any of the fishers listed in the spreadsheet attached, are members of his association. This is to help Spectrum track who has been spoken to and who hasn’t. Spectrum also requested from[redacted], if any stakeholders have any concerns about the update to please inform Spectrum of their concerns. Additionally, Spectrum requested a proposal from SETFIA regarding SMS notifications as Spectrum believe it is a good method of sending updates to fishers in the area prior to the survey commencing. Spectrum stated that the commencement of the survey is not decided yet, however require to have a plan of action. Via email outgoing 11/02/19: Spectrum acknowledged that they had already financed an SMS service by SETFIA and apologised for the confusion. Via email outgoing 12/02/19: In response to the email incoming sent 11/02/19, Spectrum stated they had re-read the email incoming send from [redacted] on 11th February 2019. Spectrum requested a brief

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			paste to the Facebook page. [redacted] stated he is unable to attach the PDF to the Facebook page. [redacted] asked what Spectrum were able to provide. [redacted] stated he would review the spreadsheet to determine which of the names listed are linked to his association. Via email incoming 12/02/19: [redacted] stated the list provided was extensive. [redacted] had started to work though the list however cross checking several associations and their members against the list provided is a big job. [redacted] stated he has been instructed to stock all oil/gas work following their second bad debt. [redacted] requested for Spectrum to phone him. Via email incoming 12/02/19: [redacted] informed Spectrum that he is able to attach the images to the SMS, not attachments. Via email incoming 14/02/19: In response to Spectrum's request to have [redacted] review the list of AFMA fishers and determine those linked to his association, [redacted] stated that sending your communication to the list of all AFMA concession holders will not work because often fishermen lease their concession from another entity. [redacted] stated from experience he thinks that the concession owner is highly unlikely to forward correspondence to their lessee. Further, the list of entities that Spectrum have from AFMA will be for fisheries that cover your polygon but many (most?) of these operators will operate within that fishery hundreds or even thousands of kms from the Spectrum polygon. [redacted] stated that SETFIA (and SSIA) cannot divulge the names and details of their members. [redacted] made an attempt to cross check the list of concession holders Spectrum provided against their membership but soon found that he was unaware of the business names that their members operate, some operate numerous entities. [redacted] stated he was not prepared to call members and ask them to list all their business names. SETFIA and SSIA appreciate the efforts Spectrum have made to obtain fishery data, identify affected sectors (some being more affected than others), identify affected associations and to contact the extensive (but not exhaustive) list of potentially affected stakeholders. [redacted] stated surely that is sufficient. SETFIA and SSIA remain available to SMS the western stakeholder list.		description of the SMS service in addition to what [redacted] had written in the past, would be useful ("SMS messages to the relevant western fleet at engagement and then at regular and shortening intervals so operators can plan to be elsewhere (doing so minimises your potential effect), SMS messages as required as the survey progresses and then at conclusion"). Spectrum provided two image attachments and requested if the images could be posted to the SETFIA Facebook page. Via email outgoing 12/02/19: In response to the email incoming sent 12/02/19, Spectrum stated they will call [redacted] to discuss the issues with the list. Spectrum stated they would consider alternate ways to combat the list. Via email outgoing 12/02/19: In response to the additional email incoming from SETFIA sent 12/02/19, Spectrum acknowledges [redacted] ability to distribute the images through SMS and note that there are no issues regarding the SMS service he is providing. In response to the information provided by [redacted] in the email incoming dated 14/02/19, Spectrum note that the request was extensive and appreciate SETFIA's efforts towards it. Spectrum have consulted with AFMA regarding the concession holders of the SESSF. As described in "AFMA" above, the representative of the SESS Fishers stated that all fishermen, whether they be leases or holders have an interest in the fishery. The AFMA representative stated that only those holding or leasing 'Boat' licences are able to catch the quotas that they own or lease. All concession holders of the SESSF fishery have had their details purchased by Spectrum from AFMA. Spectrum have send consultation information to all concession holders whether they hold quota licences or boat licences. Spectrum further followed up with additional phone calls and emails to all SESSF licence holders to determine whether the licence holder was active or had interest in the area being surveys. For those licence holders that contact was unable to be made to determine if they were going to be within the operational area, or have interest in the survey are, Spectrum treated them as relevant and they are continuing to be consulted regarding the proposed survey. If any of these stakeholders raise issues post submission of the EP, their concerns or issues will be addressed through ongoing consultation.
	21/02/19 21/02/19 21/02/19 21/02/19 21/02/19	Email outgoing Email incoming Email outgoing Email incoming Email outgoing	Via email incoming 21/02/19: [redacted] stated that SETFIA had not posted to the Facebook page but were happy to do so. Requested Spectrum send them what they would like to be posted Via email incoming 21/02/19: [redacted] sent a link to the Facebook page and asked Spectrum if what he had posted was okay.	SETFIA's request for material to be posted on the Facebook page is merited. Merited as allowed Spectrum to disseminate information to large number of stakeholders affected by the survey.	Via email outgoing 21/02/19: Spectrum enquired with[redacted] as to whether the images had been posted to the SETFIA Facebook page yet. Via email outgoing 21/02/19: Spectrum attached the email previously sent on the 12th February 2019, containing the material requested to be posted Via email outgoing 21/02/19: Spectrum thanked [redacted] for his efforts and stated that the post looked good. Spectrum stated their desire to have the second image included in the email sent 12th February 2019 also included in the post, however stated if it takes up too much room on the webpage designed for their members then it's okay to be excluded. SETFIA is considered a relevant stakeholder and will continue to receive updates regarding the proposed Otway Deep MSS.
		Ongoing consultation: Spectrum will continue to provide project updates to SIV and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Southern Rock Lobster Limited (SRL) [redacted]	04/07/18 04/07/18 13/07/18	Phone call outgoing 2nd Formal Notification 2D Research & Conservation	Via phone call 04/07/18: Spectrum discussed the proposal with SRL and explained Spectrum had provided information to representative bodies but had not had feedback. Spectrum stated they wished to consult with individual fishers as well as representative bodies as required by NOPSEMA to ensure Spectrum can demonstrate that they have attempted to	No objections or claims.	Via email 04/07/18: Spectrum followed up the phone call with an email and a copy of the second stakeholder consultation letter – research and conservation. Spectrum asked if the information could be provided to operators in the southern zone of the SA rock lobster fishery. Via phone call outgoing 13/07/18:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Phone call outgoing	contact all fishers. The stakeholder provided some background information about the different organisations.		Spectrum phoned SRL to follow up on past communication. No answer so left a message.
	17/07/18	Phone call outgoing	Via phone call 17/07/18: During Spectrum's phone call to SRL, they advised Spectrum that state based associations were continuously being contacted for consulting purposes. SRL advised they are in the process of creating a policy to be used when consulting for all offshore projects with southern rock lobster fishermen. SRL intend to become the only contact point for consultation. Relayed that most fishermen follow what is produced from FRDC regarding the seismic impacts on rock lobsters. Advised that any information passed to SRL will be passed on to state associations and then passed on to individual licence holders, and that the SRL board does have some licence holders on it. SRL confirmed that a policy was created and that it would be sent out in the next week.	No objections or claims, however Spectrum will review the policy when it is made available to the public.	Via phone call outgoing 17/07/18: Spectrum phoned SRL to follow up on past communication. Discussed that Spectrum had been in contact with Nathan Kimber from SARLAC (SA) and he had mentioned that SRL were preparing a report for consultants regarding seismic and lobster fishers. Ongoing enquiries about the policy are below, however the policy is still in progress.
	02/08/18 15/08/18 19/09/18	Email outgoing Email incoming Email outgoing	Via email incoming 15/08/18: SRL stated they were still working on the policy but provided a link to their understanding on the impacts of seismic testing (FRDC link). Asked for confirmation that the commercial vessels conducting the surveys will not be engaged any recreational fishing activities, as fishing activities from a commercial vessel require a licence in any State of Australia. They expressed an interest in working with the oil and gas industry on regenerative and stock rehabilitation programs.	SRL provided link to a report that could be considered by Spectrum and requested confirmation that the survey vessels would not be engaged in recreational fishing. Request for confirmation on commercial vessels is merited due to their role as a peak body representing the interests of SRL fishers. Action: Spectrum to review and confirm the report has been considered in the impact assessment. Action: Spectrum to confirm no recreational fishing will occur on the seismic vessels.	Via email outgoing 02/08/18: Spectrum emailed to ask about the status of the policy. Via email outgoing 19/09/18: Spectrum confirmed to SRL that the FRDC report (Day et al 2016) had indeed been used to inform the impact assessment in the EP as well as in establishing control measures, and attached a copy of the second stakeholder consultation letter – fisheries. Spectrum confirmed the EP included a control measure that recreational fishing from the vessels was prohibited.
	01/02/19	3rd Formal notification 3A General	No response has been received in response to the 3rd formal notification sent to SRL on the 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	14/03/19	Email outgoing	No response has been received in response to the email outgoing to SRL sent on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to CFAC's feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19: In response to SRL's comments regarding the creation of a policy for consultation with rock lobster fishermen across the 3 jurisdictions as described in the phone call outgoing on the 17th July 2018. Spectrum followed up with an email querying the status of the policy on seismic and lobster fishermen, Spectrum questioned SRL if the policy has been completed, to please send it onto Spectrum representatives. SRL is a relevant stakeholder and will continue to receive updates regarding the proposed Otway Deep MSS.
		Ongoing consultation: Spectrum will continue to provide project updates to SRL and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Sustainable Shark Fishing Inc (SSFI) [redacted]	09/02/18 07/04/18 01/06/18 01/02/19	1st formal notification 1A General Email outgoing (FLO) 2nd formal notification 2C Fisheries 3rd formal notification 3A General	No response has been received in response to the 1st formal notification, email outgoing, 2nd and 3rd formal notifications sent to SSFI on the 9th February 7th April and 1st June 2018 and 1st February 2019 respectively.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to SSFI and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Tasmanian Rock Lobster Fisherman's Association (TRLFA) [redacted]	09/02/18 06/04/18 07/04/18 12/04/18 23/05/18 24/05/18	1st formal notification 1A General Email outgoing Email outgoing (FLO) Conference Call	No feedback received in response to the first stakeholder consultation letter. Via conference call on 12/04/18 (Spectrum, FLO, TRLFA and TSIC): TRLFA expressed concern about the location of the survey and potential impacts to larval stages of rock lobster. They stated that they consider the killing of even one phyllosoma to be unacceptable.	TRLFA expressed concerns about impacts on the larval stages of rock lobster (the killing of even one phyllosoma to be unacceptable). Also noted concerns about egg production in the northwest of the Tasmanian rock lobster fishery. Spectrum appreciates TRLFA's concerns for the Southern Rock Lobster fishery and as such has conducted a risk and impact assessment using	Via email 06/04/18: Spectrum arranged a time to meet with TRLFA. Via email 07/04/18 Spectrum provided the first stakeholder consultation letter again along with maps. Via conference call meeting minutes on 12/04/18 (Spectrum, FLO, TRLFA and TSIC): Spectrum acknowledged the value of the feedback provided and that discussions are aimed at reaching agreement on mitigating potential impacts.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	01/06/18 12/07/18	Email outgoing (FLO) Email incoming (FLO) 2nd formal notification 2C Fisheries Meeting	Noted that they were uncertain where larvae from the survey area would typically disperse to but that potential damage to any stocks was a concern and that any impacts to rock lobster larval duration or distribution would be problematic. TRLFA described concerns about egg production in the northwest of the Tasmanian rock lobster fishery and noted that giant crab stocks were at the lowest level observed (attributed to the impacts of another fishery). Via email outgoing 23/05/18: FLO emailed [redacted] to let him know he had spoken with Spectrum about industry concerns with the impacts of the survey on the giant crab fishery. FLO said he had spoken to a giant crab fisher who mentioned there is a TRLFA meeting coming up and asked [redacted] if that would be an appropriate forum to continue discussions. Via email incoming 24/05/18: In response to FLO's email, [redacted] replied that the next TRLFA meeting is next Wednesday in Launceston and the agenda was already full. He said the best he could do was to offer a spot at the AGM on Oct 31 in Hobart.	the best available science which has been used to develop mitigation controls. Spectrum considers that it is unreasonable for the TRLFA to consider the mortality of one phyllosoma to be unacceptable. Killing one phyllosoma unacceptable: In relation to the claim that killing even one phyllosoma would be unacceptable, Spectrum consider this claim to be unrealistic given the high rates of natural mortality and inconsistent with Acceptable levels of impact defined under the OPGGSA 2009 regulations. This concern is not merited and has not been addressed by Spectrum. Action: Spectrum to address TRLFA concerns about potential impacts of the survey location on the rock lobster larval stages and egg production and ensure they are considered in the impact assessment.	Spectrum referred to the 2017 CSIRO study that showed that effects on larvae were limited to three days and not that different from natural events, and informed that the special spread of lines meant sound levels were not consistent over time. They advised that all available literature on spawning of key fisheries species was being reviewed and that the potential impacts would be assessed in the EP. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter that included a summary of the EP impact assessment for all key fisheries species and the control measures adopted to reduce impacts to ALARP. No feedback received in response to the second stakeholder consultation letter. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to larvae and plankton (incl. eggs) and spawning The potential impacts of seismic surveys on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the airgun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to diel migration of plankton (including larvae) between surface and deep waters. Consequently, predicting impacts is difficult due not only to the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey. Although the recent work by McCauley et al. (2017) and Richardson et al. (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. The results from Day et al (2016) show that lobster, including buried lobster, exposed to 209 dB SPL did not suffer lethal effects and their larvae showed similar levels of survivorship to those not exposed to seismic noise. Day et al (2016) concluded no effects on lobster embryos early in development within 1 to 1.5km of the seismic source.
	12/07/18	Meeting	Via meeting 12/07/18 (TSIC, TRLFA and Spectrum): TRLFA stated their members unanimously oppose seismic activities and are prepared to take Spectrum to court. They noted that consulting with fishers individually is not consultation because they are only concerned about their own interests and not the industry. They raised concerns about the wider community and again about how the survey will impact zooplankton and the associated impacts on larvae. They don't know what effect this will have on catchable stocks in five years' time. Additional feedback from this meeting is covered under TSIC in this table.	TRLFA stated they object to seismic surveys and claimed that consulting with individual fishers was inappropriate. Action: Spectrum to address stakeholder claims regarding their consultation approach of contacting individual fishers.	Via meeting 12/07/18 (TSIC, TRLFA and Spectrum): Spectrum acknowledged the TRLFAs objection to seismic surveys. In response to their claim that consulting individual fishers is not consultation, Spectrum explained that they are required to consult with stakeholders on all levels, i.e. not only peak bodies such as TRLFA, but that the concerns of individual fishers also had to be addressed. Spectrum are required to demonstrate they have made attempts to reach all licence holders, not just those represented by peak bodies. The merit of the concern regarding impacts to zooplankton and larvae has been addressed above. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No response has been received in response to the 3rd formal notification sent to TRFLA on the 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	14/03/19	Email outgoing	No repose has been received in response to the email outgoing sent to TRFLA on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to TRFLA's feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19: In response to TRFLA's comments made during a conference call on 12 April 2018, regarding the NOPSEMA response to correspondence from the Northern Territory Seafood Council which raised concerns within the Australian Seafood Industry and noise impacts to fish based on the Gippsland study, Spectrum provided TRFLA with the following consultation material. Spectrum attached the NOPSEMA response to correspondence form the Northern Territory Seafood Council (NTSC) which raised concerns within the Australian Seafood

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Industry. Spectrum also summarised the noise impacts to fish from seismic noise, based on the 2018 study by Bruce et al. The recent study in the Gippsland marine region found little evidence of consistent behavioural responses, i.e. movement out of the area of the seismic survey, form two species of shark. In the same study, the tiger flathead was reported as moving out of the seismic survey area, however was no indication that the tiger flathead departed the experimental areas a result of the seismic survey itself. Although some studies have shown a degree of residency for flathead species, (Fetterplace et al. 2016), all but one tiger flathead departed the monitored area by mid-June of the study, suggesting a possible seasonal movement out of the area (Bruce et al. 2018) The range of flathead movement (i.e. increased swimming speed during the seismic survey period and changed diel movement patterns after the survey) was not sufficient to generate a significant displacement. Slotte et al. (2004) also reported no change in short-term horizontal distribution of herring, blue whiting and mesopelagic species, however these species were found in deeper waters during seismic exposure compared to their pre-exposure distribution, indicating that vertical movement rather than horizontal movement could be a short- term reaction to seismic sound (Carroll et al. 2017) The impacts on fish species within the survey area as a consequence of seismic activity are mainly expected to be behavioural. These are likely to be temporary as the seismic vessel traverses each survey line, localised in spatial extent, and most relevant to continental slope habitat which comprises only a small part of the overall survey area. Behavioural responses are more likely to result in changes in diel movements (vertical) rather than horizontal movements, and it is unlikely that fish will be displaced from the survey area, particularly given that the area will not be permanently ensonified for the whole duration of the survey. This is because the survey vessel will traverse sail lines starting inshore and moving offshore, with each subsequent sail line typically being between 8 and 12 km away from the preceding line. Fish exposed to received sound levels eliciting a behavioural response will therefore recover between sail lines.
		Ongoing consultation: Spectrum will continue to provide project updates to VRLA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP			
Tasmanian Seafood Industry Council (TSIC) [redacted]	09/02/18 28/03/18 29/03/18 29/03/18 03/04/18 04/04/18 05/04/18 06/04/18	1st formal notification 1A General Phone call outgoing (FLO) Phone call outgoing (FLO) Phone call incoming (FLO) Email outgoing (FLO) Emails outgoing (x2) (FLO) Emails outgoing (x3) (FLO) Email outgoing	No feedback received in response to the first stakeholder consultation letter. Via phone call 29/03/18: TSIC returned FLO's phone calls, and they discussed the FLO's role and an appropriate date for meeting in person.	No objections or claims.	Via phone calls 28/03/18 and 29/03/18: The FLO phoned TSIC to introduce the project and explain his role in the consultation process. No answer, left message. Via emails outgoing on 03/04/18, 05/04/18 and 06/04/18: The FLO liaised with stakeholders and Spectrum to arrange face to face meetings in Melbourne and Hobart. FLO emailed meeting series of maps on 05/04/18 and attempted to confirm face to face meeting location and time on 06/04/18. No response received.
	12/04/18 01/06/18	Conference call 2nd formal notification 2C Fisheries	Via conference call on 12/04/18 (Spectrum, FLO, TRLFA and TSIC): Impacts on larvae and adults: TSIC noted concerns with impacts on larvae as well as adult populations and noted that there were spatially broad larval corridors. TSIC stated that there was difficulty in applying the findings of the rock lobster study on all stages of the animal's life history and that of other bivalves. NTSC seismic study: They referred to correspondence from the NTSC which had raised concerns within the Australian Seafood	TSIC expressed concerns about impacts to fish populations during adult and larval stages, NTSC noise modelling outcomes and the cumulative impacts of multiple seismic surveys. The concern is merited due to TISC representing the interests of people who may be impacted by the survey.	Via conference call on 12/04/18 (Spectrum, FLO, TRLFA and TSIC): Impacts on larvae and adults: Spectrum acknowledged TSICs concerns and noted the importance of obtaining detailed information on fishers' activities and noted that data sharing requests had been made to all fishing operators identified by the FLO. Spectrum advised that they were undertaking ongoing consultation to minimise interference with fishing activities. Spectrum said the literature review conducted for the impact assessment has been thorough and included all publicly available research. They advised that a summary of the impact assessment outcomes is being drafted to provide to stakeholders that

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			Industry. TSIC had difficulty interpreting the noise information but noted that the industry was seeking broader assurance because the anecdotal information about damage from seismic noise was causing alarm. Cumulative effects: TSIC raised concern about the cumulative effects of multiple seismic surveys (between the Spectrum and 3D Oil proposals). Noted that 3D Oil had not consulted with TSIC and they were alarmed about the effects of seismic on rock lobsters given the scallop history.	Action: Spectrum to address TSICs concerns and ensure they are considered in the impact assessment. Action: Spectrum to provide summary of impact assessment to TSIC.	outlined the results of the noise modelling and the different sensitivities of fish (temporary but recoverable effects up to 3.9-4.0 km) and invertebrates (sub-lethal effects within 250 m). Spectrum further explained that the airguns would not be operational on line turns in the operational area and would undergo soft-start procedures and ramp up on within the survey area boundary. Spectrum referred to a CSIRO study that showed a short term effect on larvae and that these were not much different from natural events. The spatial spread of survey lines meant sound levels were not consistent over time . NTSC seismic study: Spectrum advised that the NTSC letter to NOPSEMA did not align with the findings of the CMST report they commissioned. The apparent mismatch in sound modelling information has been reviewed and the outcomes addressed in the Otway Deep EP. Cumulative effects: Confirmed there was no overlap in acquisition between 3D Oil and Spectrum and that Spectrum would seek a 40 km separation if two boats were operating. Spectrum requested feedback from TSIC on the spatial extent of Tasmanian fishers' activities within the operational area and enquired whether it was possible to obtain spatial information about Tasmanian fisheries. Via email 01/06/18: Spectrum provided TSIC with the second stakeholder consultation letter that contained a summary of the impact assessment for fisheries, including the control measures adopted by Spectrum to reduce impacts. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to larvae and plankton (incl. eggs) and spawning The potential impacts of seismic surveys on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the airgun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to diel migration of plankton (including larvae) between surface and deep waters. Consequently, predicting impacts is difficult due not only to the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey. Although the recent work by McCauley et al. (2017) and Richardson et al. (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. The results from Day et al (2016) show that buried lobster exposed to 209 dB SPL did not suffer lethal effects and their larvae showed similar levels of survivorship to those not exposed to seismic noise. Day et al (2016) concluded no effects on lobster embryos early in development within 1 to 1.5km of the seismic source. Although, the larvae were not in the plankton when exposed to seismic noise, this is the best available science of the effects on embryonic stage lobster exposed to high intensity seismic noise, the equivalent of within 260m from the source array, and the results show that survival was not affected. NTSC seismic study Spectrum is aware of a study that the Northern Territory Seafood Council (NTSC) commissioned Curtin University's Centre of Marine Science and Technology (CMST) to conduct cumulative SEL modelling for a number of different line acquisition scenarios of different durations in order to understand how cumulative sound exposure levels (SELcum) changed. The NTSC specifically questioned the Bethany marine seismic survey EP with regard to their concerns about the appropriateness of using a 24 hour period to assess SELcum and the potential for TTS and other effects associated with SELcum. Spectrum have reviewed the CMST modelling and NTSC concerns and highlights a key limitation of the modelling below is that it does not account for the hearing abilities of fish or biological effects of the SELcum. Modelling of SELcum over periods of 24 hours

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					or longer assume that very distant single shot SELs will be audible to fish and contribute to hearing fatigue that may eventually result in TTS. In reality, fish will not hear sound over these distances, hence including the accumulated sound energy from distant shots over a full 24-hour period SELcum is considered to be conservative. The 24-hour modelled scenario accounts for a) the relatively rapid accumulation of sound at close range to a fish, plus b) a significantly greater amount of sound produced over the 24 hours that fish are unlikely to actually hear. Cumulative effects An investigation of the NOPSEMA shows that there are no surveys that overlap with the Otway Deep survey. Therefore, the 3D Oil survey will not overlap spatially with the Otway Deep survey. Spectrum plans to maintain a close dialogue with 3D Oil and will implement a separation distance of 40 km between the two vessels in the event of concurrent operations. This is based on the recommendations of the Bureau of Ocean Energy Management (BOEM 2014) that maintaining a 40 km geographic separation distance between active seismic vessels would minimise cumulative impacts to marine life. JASCO modelled cumulative seismic sound levels for the Otway Deep 3,475 in3 source and the 3D Oil 3,260 in3 source and calculated received sound levels at several points of interest. The maximum sound level at a point midway between two active seismic sources (20 km from each) was predicted to be <150 dB re 1µPa. Spectrum requested feedback from TSIC on the spatial extent of Tasmanian fishers' activities within the operational area and enquired whether it was possible to obtain spatial information about Tasmanian fisheries.
	28/06/18	Phone call outgoing (FLO)	Via phone call 28/06/18: FLO phoned TSIC and stated that Spectrum had been liaising with some of the major crab producers who had suggested that a trimming of one corner of the survey might provide a solution comfortable to both parties. TSIC said there was great concern at a recent TRLFA meeting, that they were contemplating legal action and were most unhappy about the timing of getting news about submission of the EP. Spoke about the next face to face meeting with Spectrum.	TSIC reported on the concern at recent TRLFA meeting. No new issues were raised, therefore no action required in response to this feedback.	NA.
TSIC (continued)	12/07/18	Meeting	Via meeting 12/07/18 (TSIC, TRLFA and Spectrum): TSIC were dissatisfied with consultation conducted by Spectrum, including the appointment of the FLO and the engagement of [redacted] from SETFIA. They made an offer of their own consultation services. TSIC advised Spectrum they are convinced of the destructive nature of the seismic industry, referring to the 2010 CarbonNet seismic survey that destroyed the Bass Strait scallop industry. TSIC pointed out that the acoustic modelling Spectrum referred to is for adult crustaceans and asked about larvae which exist at depths of 1000 m, 2000 m, etc. They stated they are particularly concerned with the impact to the larvae of crustaceans and impacts to crustaceans in the spawning corridor along the shelf. They are concerned about future impacts to crustaceans if larvae are affected now by the survey. TSIC suggested that given the research gaps that exist, a larval tow be carried out along various locations throughout the water column at various times before the survey.	No merited objections, however TSIC claimed that seismic surveys are destructive to fisheries, referring to the CarbonNet survey in 2010 as evidence. They expressed concerns about impacts to the larvae of crustaceans and suggested larval tows be conducted before the survey. Action: Spectrum to address stakeholder claim that seismic surveys will adversely impact Tasmanian fisheries, and their concerns about impacts to crustacean larvae. Action: Spectrum to consider if there is benefit in conducting larval tows.	Via meeting 12/07/18 (TSIC, TRLFA and Spectrum): Spectrum stated if they were not happy with the use of the FLO and [redacted], that they were welcome to submit a proposal to conduct consultation for the fishers they represent. Spectrum representative stated in the meeting they were unable to comment on the impacts of previous surveys, but the Otway Deep MSS was a deep-water survey and not a shallow water survey. Acoustic modelling indicates that crustaceans will experience behavioural disturbance at 209 dB at 260 m, which is miles away from the location of the survey. Spectrum subsequently responded to TSIC's concerns via formal response to a report they later produced. Regarding impacts to larvae, Spectrum stated that information regarding modelling of larval sources highlights the broad current-driven linkages between areas. This has been identified as a key factor in reducing potential small-scale impacts from seismic activities. The response contained an appendix with further information on the impact assessment for crustacean larvae. Regarding larval tows, Spectrum stated that the logistics and science required for larval tows for assessment against thresholds is not feasible given the scope of the proposed seismic survey and the control measures already adopted (refer to consultation event with TSIC dated 03/08/18).
	23/07/18 25/07/18 26/07/18 26/07/18 27/07/18 27/07/18 03/08/18 03/08/18	Email incoming Email outgoing Phone call outgoing Email outgoing Email incoming Email outgoing Email outgoing	Via email 23/07/18: TSIC provided a draft report to Spectrum that highlighted a number of issues from their members. [redacted] The following key concerns were raised in the report: lack of understanding within the Tasmanian seafood industry concerning the proposal which illustrates that previous consultation processes employed by Spectrum were inadequate direct impact on Tasmanian fishers' capacity to operate, as the proposed zone overlaps giant crab and longline fishing activities.	The report developed by TSIC indicated that their stakeholders objected to the survey. They also raised the following key concerns: inadequate consultation process undertaken by Spectrum displacement of fishers due to the overlap of the operational area with fishers' operational areas impacts of noise on adult giant crabs and rock lobsters	Spectrum accepted TSIC proposal to consult with fisheries stakeholders on their behalf. Via email 25/0718: Spectrum replied to TSIC email sent 23/07/18 stating a response to their draft consultation report was being prepared and they would need TSICs help passing it to their members. Spectrum requested a list of the names of the license holders who expressed concerns and where applicable, areas where they have fished (or at least depth ranges). Via phone call 26/07/18: Spectrum phoned to follow up on previous email. No answer.

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	06/08/18	Phone call outgoing Email incoming	the impact of seismic on adult giant crabs and rock lobster within the direct and broader Spectrum Geo Otway Deepwater Seismic Survey region. the impact of seismic on the larvae of commercial species. In particular, there is concern for rock lobster larvae as it has a 18–24 month larval cycle, and the source/sink dynamics of this larvae are still unknown the time provided to TSIC/TRLFA to drive this consultation process was inadequate general consensus that the Spectrum Geo Otway Deepwater Seismic Survey should be delayed or even stopped all together. TSIC made the following recommendations in the report: there must be further negotiations with Spectrum Geo to ensure compensation for those fishers that can prove they will not be able to fish during the proposed survey falling short of any further research on the impacts of seismic on the larvae of commercially caught species, there must be pre-seismic survey larval tows conducted, and all seismic activity halted in regions if larvae counts exceed agreed thresholds falling short of an extensive and expensive Before-After study on the impacts of the proposed survey on adults, juveniles and larvae and the potential flow on impacts for the commercial fishing fleet now and into the future, Spectrum Geo should consider contributing towards a Tasmanian Seafood Community Fund to help rehabilitate ecosystems in lieu of the considerable uncertainties and doubts within the Tasmanian seafood industry. Via email 27/07/18: TSIC replied stating they were unavailable and that they would address some of Spectrum's requests but was concerned about providing specific details of fishers including names. TSIC noted that the final report would include TSIC/TRLFA position and recommendations on behalf of all their members. Via email 06/08/18: TSIC replied stating they would review Spectrum's responses and attached a final report.	impacts of noise on the larvae of commercial species. Action: Spectrum to respond to the four key concerns listed above. Action: Spectrum to consider the recommendations proposed in the report and respond to TSIC.	Via email 26/0718: Spectrum emailed requesting some items be clarified in the report as required under the scope of work. Via email 27/0718: Spectrum replied that fishers details were only required to ascertain which ones had already been consulted with and which ones were "new". Asked if the report could be delivered the next week. Via email and phone call 03/08/18: Spectrum emailed responses to the TSIC draft report and followed up with a phone call to inform them. No answer. The following responses were relevant to the key concerns: Consultation: Spectrum stated they had gone to considerable lengths to ensure all stakeholders had been consulted. They explained that the process is very complex and requires considerable detective work to obtain specific contact details for fishers and fisheries representative bodies and for this reason, it is prolonged and ongoing, and Spectrum appreciates the importance of continuing to engage with peak bodies such as TSIC. With regard to consultation with TSIC in particular, they were first formally notified about the project on 09/02/18 and Spectrum followed up with several unanswered phone calls and emails during March and April to try and arrange a meeting with TSIC. A conference call was held in April to discuss TSIC's concerns, which Spectrum then fed into the impact assessment for the EP. The next formal consultation letter was provided for their information on 01/06/18. When TSIC expressed dissatisfaction over Spectrum's approach of using the FLO or [redacted], Spectrum welcomed TSIC's own proposal which was then adopted. Spectrum considers that TSIC and their members have had sufficient time to understand the proposal and provide feedback to Spectrum. Spectrum has provided several avenues through which feedback could be provided (via email, phone, text, face to face wharf and office meetings, conference calls, and via representative bodies). Spectrum endeavoured to provide enough information for stakeholders who want the details, without overwhelming those who want less information and have continuously encouraged stakeholders to get in contact if they wish to discuss the information provided, or if they wanted more information. Displacement of fishers: Spectrum stated that since most of the intended survey area occurs beyond fishing depths the key area of potential overlap with fishing activities is along the continental slope and shelf break which support highly diverse and productive ecosystems (including the West Tasmanian canyons). In response to earlier feedback from Tasmanian fishers (prior to the consultation process by TSIC), Spectrum has modified survey plans in southern areas adjacent King Island to avoid the reef slope area where fishers may operate. Ongoing consultation to alert stakeholders about survey plans along with control measures to minimise the duration of surveys in any particular area will also reduce potential overlap between survey and fishing activities. In addition, payment of compensation to the rightful owner for any fishing equipment that has been damaged beyond repair by the survey and cannot be re-used. These controls have been incorporated into the EP and hence will be a regulatory requirement for the survey. Impacts of noise on adult fish species: Spectrum has provided a summary of the noise modelling and impact assessment including the potential seismic effects on commercially fished species (attached to the response). Spectrum stated they believed that the location of the survey and the control measures in place will ensure that impacts due to seismic activities will be short-term and localised. Impacts of noise on larvae: Spectrum replied that these concerns mirror general concerns previously voiced by fishers over the potential impacts of seismic activities on adult and planktonic stages. The information regarding modelling of larval sources highlights the broad current-driven linkages between areas. This has been identified as a key factor in reducing potential small-scale impacts from seismic activities. Spectrum provided a summary of the impacts and control measures associated with mitigating impacts to larvae attached to the response. Impacts to Giant Crab: Given, the giant crabs are found in <460m water depth, with spawning generally occurring within this depth range during winter (outside of the survey season), it is unlikely that there will be effects to giant crabs, or to the catch, or recruitment to the fishery. This is further supported by the most recent work on the effects of seismic on snow crab fishery catch rates, where no effect on catch rate was

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					reported, and that if any effects these would be less than changes related to natural spatial and temporal variation (Morris et al. 2018).
TSIC (continued)					With regard to the recommendations made by TSIC, Spectrum provided the following response: Recommendations 1 and 3: Spectrum notes that it agrees to compensate fishers for equipment that is damaged beyond repair and cannot be re-used as a direct consequence of survey activities. However, compensation due to loss of a fishery is not a reasonable request to consider given the additional control measures in place to minimise displacement of fishers, the inherent variability in abundance of commercial fish species, and reasonable expectation that fishers can utilise alternative fishing grounds in the short term. Recommendation 2: The logistics and science required for larval tows for assessment against thresholds is not feasible given the scope of the proposed seismic survey and management measures in place to minimise impacts.
	09/08/18 28/08/18 30/08/18 11/09/18 13/09/18 14/09/18 21/09/18 17/10/18 17/10/18 30/10/18 01/11/18 14/11/18	Email outgoing Phone call outgoing Email outgoing Phone call outgoing Email incoming Email outgoing Phone call outgoing Phone call outgoing SMS outgoing Email incoming Email outgoing Email incoming	Via email 13/09/18: In response to Spectrum's email 30/08/18 and phone call 11/09/18, TSIC advised Spectrum that their response to the TSIC report had not been distributed to members and therefore that no feedback had been received. TSIC stated they were waiting to meet with Spectrum again in light of two other companies proposing seismic surveys within the Otway at the same time of year, but that the date proposed was not suitable and without a date they cannot tell which members will attend. TSIC again expressed dissatisfaction with Spectrum's consultation process. TSIC advised that they were now very uncomfortable with the Spectrum proposal in light of the two other proposed seismic surveys in the region at the same time, with no science around cumulative effects of seismic. TSIC stated that they would be articulating this cumulative impact concern to NOPSEMA. Via email incoming 30/10/18: TSIC enquired on what stage Spectrum was at with NOPSEMA submission Via email incoming 14/11/18: TSIC provided a response to Spectrum's response to the report produced by TSIC	TSIC expressed concern over multiple seismic surveys proposed for the same area and dissatisfaction with Spectrum's consultation.	Via email 09/08/18: Spectrum accepted TSIC's final report and communicated their plan to meet face to face when TSIC advised their availability. Noted the EP had been resubmitted and that they affirm that consultation with TSIC would be ongoing. Spectrum requested that TSIC please let them know as and when they have any feedback from members to Spectrum's responses to the final report. Spectrum stated that they understood TSIC recommended a trip to their local fishing port to meet license holders, and requested an indicative timeline, likely members present, and any specific points for discussion. Via phone call 28/08/18: Spectrum attempted to contact TSIC to seek feedback on Spectrum's response. No answer or response. Via email 30/08/18: Spectrum emailed to communicate their intention to arrange a face to face meeting in mid-September (suggested the 14th) and to request confirmation that TSIC had forwarded Spectrum's response to their members, that if their members had feedback if TSIC could collate it, and if they could provide a list of members who wish to meet. Via phone call 11/09/18: Spectrum attempted to contact TSIC to seek feedback on Spectrum's response. No answer or response. Via email 14/09/18: Spectrum replied to TSIC's email 13/09/18 confirming they have been trying to contact TSIC to obtain response to email sent 30/08/18 and asked again if TSIC could forward the Spectrum response to TSICs members since their proposal stated that TSIC would facilitate negotiations with Spectrum to ensure Tasmanian seafood operators interests are clearly articulated. Spectrum stated they were happy to meet at TSIC's earliest convenience and reinforced that Spectrum were making all reasonable efforts to work with TSIC. Via phone calls 21/09/18, 17/10/18 and SMS 17/10/18: Spectrum attempted to contact TSIC to seek feedback on Spectrum's response. No answer or response. Spectrum have responded to each query and concern raised by TSIC throughout the consultation process and have made all reasonable effort to engage them in the process. TSIC are considered a relevant stakeholder and will Spectrum will continue to consult with them as part of the ongoing consultation process. Via email outgoing 01/11/18: Spectrum communicated to TSIC that a response to NOPSEMA's RFFWI had been submitted on the 29/10/18.
	14/01/19 14/01/19 29/01/19 01/02/19 06/02/19 06/02/19 06/02/19	Email outgoing Email incoming Email incoming Email outgoing Phone call outgoing SMS incoming	Via email incoming 14/01/19: [redacted] stated in an email state that he would be on leave, with limited access to emails and phone from 4pm 8th January to 9am 29th January. [redacted] provided contact details for the TSIC representative that will cover consultation while [redacted] is on leave. Via email incoming 29/01/19:		Via email outgoing 14/01/19: Spectrum emailed TSIC their appreciation for providing feedback and comments expressed in their previous email sent 14th November 2018. Spectrum highlighted that in the most recent letter provided by TSIC, Recommendations were made to delay the seismic survey by 12 months, Spectrum can confirm that the survey will be delayed allowing for more consultation time. Spectrum stated, to avoid slippage, Spectrum hope to continue existing discussions and a response will soon be sent through to TSIC regarding their comments.

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	13/02/19 15/02/19 26/02/19 28/02/19 05/03/19 12/03/19 12/03/19	SMS outgoing Phone call outgoing Email outgoing Email incoming Email outgoing Email outgoing Email incoming Email outgoing	TSIC responded to Spectrum's email stating they would need to see what Spectrum produce and under what context Spectrum would like TSIC to disseminate information. TSIC stated they have already provided the best consultation in the time frame provided, produced a draft and final report and replied to Spectrum's comments on TSIC's reporting. TSIC stated any further negotiation was not included in their workload. Via SMS incoming 06/02/19: TSIC sent an SMS to the Spectrum representative, stating they are currently busy with the wooden boat festival in which they run. Stated they are offline until the middle of next week. Via email incoming 26/02/19: [redacted] apologised for his quietness as the new year has been very busy for TSIC. TSIC stated with respect to Spectrum's request to provide TSIC members with the latest "Fact sheet" (3rd formal consultation 3A General), TSIC is happy to include I tin the TSIC Update newsletter that will be distributed next Friday, however noted in his view TSIC has already delivered fully against previous consultation agreements with Spectrum. Inquired as to whether this suited Spectrum's needs. Via email incoming 12/03/19: TSIC informed Spectrum that as discussed TSIC newsletter including the stakeholder update (3rd formal notification 3A General) went out to all TSIC members via email or hard mail (if no email) last Friday 8th March 2019. TSIC attached the newsletter.		Spectrum requested confirmation from TSIC that they are able to disseminate the next response Spectrum delivers to their members – lest TSIC members think that Spectrum are not interested in having dialogue with them. This would be detrimental to the consultation process objectives and contrary to the consultation plan that Spectrum and TSIC had agreed to from last year. Via email outgoing 01/02/19: Spectrum thanked TSIC for their response regarding the request to providing TSIC members with Spectrum's consultation update advising of the change in the survey timeframe. Spectrum attached the 3rd formal notification 3A to TSIC, describing the new timeframe, noting there are no other changes to the proposed survey. Spectrum inquired as to whether TSIC would be willing to send the update to their members. Via phone call outgoing 06/02/19: Spectrum attempted to contact TSIC via phone call, no answer from TSIC. Via SMS outgoing 06/02/19: Spectrum responds to the SMS incoming from TSIC, inquiring whether TSIC are willing to discuss a fee for their time if they are able to send the timing update (3rd formal notification 3A) out to their members before the weekend. Spectrum stated it is a short letter stating the survey has been delayed. Spectrum stated that Victorian and Commonwealth fishers have already been notified regarding this update to the change in timing, and that Tasmanian fishers may feel agitated they have not been informed but others have. Via phone call outgoing 13/02/19: Spectrum attempted to contact TSIC via phone call, no answer from TSIC. Via email outgoing 15/02/19: Spectrum followed up the SMS incoming from TSIC regarding their willingness to distribute the stakeholder update (3rd formal notification 3A) to their members. Spectrum inquired as to whether they are able to come to arrangement with TSIC to send the stakeholder updates to their members. Spectrum have already distributed the 3rd formal notification 3A to others in the fishing industry and are concerned that TSIC members might feel left out if this information is not passed onto them, particularly if they are made aware of this update through third parties. Spectrum hopes to seek TSIC's assistance in this regard in order to capture any TSIC concerns about the revised survey timing in the next EP revision to NOPSEMA in a few weeks' time. Via email outgoing 28/02/19: Spectrum representative informed TSIC that they are currently travelling and hence their reply is short, however Spectrum really do appreciate TSIC's willingness to include the consultation update (3rd formal notification 3A General) in their next newsletter. Spectrum stated if any TSIC members do have any comments about this update to please forward them through. Via email outgoing 05/03/19: Spectrum attached the 2-page update for TSIC in case they had lost the email from below, and also provided jpegs in case it is easier to be included into the email in that format. Spectrum alerted TSIC that the update does provide a direct email and contact number to Spectrum, however if members provide their feedback to TSIC, for TSIC to forward this correspondence onto Spectrum. Spectrum reiterated this is just a draft and do not expect TSIC to generate aby further reports for Spectrum. Via email outgoing 12/03/19: Spectrum thanked TSIC for including the update in their newsletter. Reiterated that if there is any feedback regarding the update to timing to please pass this feedback onto Spectrum. TSIC is considered a relevant stakeholder and will continue to receive updates regarding the proposed Otway Deep MSS.
	08/04/19	Email outgoing			Via email outgoing 08/04/19: Spectrum reviewed and updated responses to objections and claims raised by TSIC. For the TSIC Claim that the MSS will adversely impact the larvae of commercial species, in particular, rock lobster larvae which has a 18–24 month larval cycle, and the source/sink dynamics of this larvae are still unknown. This impact will also result in impact to subsequent recruitment to adult habitat. Spectrum has provided the following updated response.

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					There is little research available on the effects of seismic on rock lobster larvae in the water column. The available evidence suggests minor effects on eggs and larvae if they are within just a few meters of the seismic source, see table below. Since rock lobster have such a long larval phase it is logical to expect that during this phase they could be widely distributed both vertically and horizontally as ocean currents. An FRDC report by Bruce et al (1996) shows that phyllosoma are very broadly distributed throughout the shelf and offshore waters of southern Australia and at very low densities, generally about 3-30 individuals per 1000 cubic meters when detected. However, many sampling sites did not detect the presence of any phyllosoma. If there is an impact, and there isn't any research to suggest there is, within a few meters of the seismic source, the loss of larvae would be extremely small relative to the broader cohort of phyllosoma distributed throughout nearshore and offshore waters. Day *et al.* (2016) exposed egg-bearing female spiny lobsters (*Jasus edwardsii*) to noise from three air gun configurations, all of which exceeded levels of 209 dB re 1 µPa (Lpk-pk). Overall there were no differences in the quantity or quality of hatched larvae, indicating that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure. Although no apparent morphological abnormalities were observed, exposed larvae from the 45 in3 experiment were found to be significantly longer than control larvae. However, the size of larvae in this study fell well within the range of natural variation, indicating natural variation in larvae is much greater that the differences observed between treatments in this study. Day *et al.* (2016a) concluded no effects on embryos early in development within 1 to 1.5 km of the seismic source. Based on the underwater sound modelling for the Otway Deep MSS, the predicted ensonified area within which received sound levels exceed Popper et al.'s (2014) mortality or mortal injury threshold for fish eggs and larvae is restricted to a distance of 110 m from the source through the water column and 166 m from the source at the seabed. In consideration of the spatial and temporal extent of this predicted impact it is also important to consider the following: Any plankton, including fish eggs and larvae, present in the water column within the survey area will not be evenly distributed, and are likely to exhibit substantial spatial patchiness and will be moving with the currents in the area; The seismic source will be constantly moving, and plankton populations are constantly being replenished by currents from non-impacted areas. Plankton populations' recover quickly due to their fast growth rates, and the dispersal and mixing of plankton from both inside and outside of the impacted area. Any mortality or mortal injury effects to fish eggs and larvae resulting from seismic noise emissions are likely to be inconsequential compared to natural mortality rates of fish eggs and larvae, which are very high (exceeding 50% per day in some species and commonly exceeding 10% per day). For example, in a review of mortality estimates (Houde and Zastrow 1993), the mean mortality rate for marine fish larvae was M = 0.24, a rate equivalent to a loss of 21.3% per day. From this assessment, predicted impacts are localised (within the 110-166 m from the source), and short-term based on estimated recovery times (days). These potential impacts are not significant when compared to rates of natural mortality in planktonic populations (10 – 50% per day), and impacts are not expected at a regional scale, based on the survey area plus 166 m buffer comprising 0.56% of the South-east Marine Bioregion. Spectrum is of the opinion that the risks and impact to RL larvae and recruitment is small relative to the extent larvae distributed broadly within and adjacent to the greater fishery and in relation to natural mortality. Further, the density of larvae within 110-166m from the source is expected to be low. the controls that Spectrum has implemented (See Appendix A) have reduced the risks and impacts to the SRL fishery to as low as reasonably practicable. An assessment of the scientific evidence provided above assess the merit of the claim made by TSIC. For the TSIC Claim that the MSS will result in physical injury to squid and their planktonic food source, Spectrum has provided the following updated response. Squid: McCauley et al. (2000) studied captive squid (Sepioteuthis australis) responses during a seismic survey, where squid showed a strong startle response to nearby air-gun start up and evidence that they would significantly alter their behaviour at an estimated 2 to 5 km from an approaching seismic source. Squid showed avoidance of the airgun by keeping close to the water surface at the cage end furthest from the

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					airgun, appearing to make use of the sound shadow measured near the water surface (an almost 12 dB difference) (McCauley et al. (2000)). McCauley and Fewtrell (2012) studied the behavioural responses of squid to seismic sound levels. In general, squid displayed an increased frequency of alarm responses, particularly at higher sound levels, and increased swimming speed in the direction of the surface as the airgun approached and remaining relatively stationary near the water surface as the airgun signal became most intense. The authors again suggested that the squid detected the sound shadow (approximate 12 dB decrease in noise levels at the water's surface compared to the levels at depth), and therefore remained at the surface while the airgun signals were most intense (i.e. avoidance behaviour) (McCauley and Fewtrell 2012). This behaviour of becoming motionless is a common component of 'crypsis' in squid, and one that squid commonly exhibit when threatened (Smith, 1997). Plankton: McCauley *et al.* (2017) reported zooplankton mortality rates more than two orders of magnitude higher than recorded in earlier studies. They found that exposure to a 150 in3 airgun shot significantly decreased zooplankton abundance and that the mortality rate increased from a natural rate of 19% per day to 45% per day. Impacts were detected out to edge of the study area, at 1.2 km from the airgun in waters 34 to 36 m deep; these water depths are considerably shallower than the majority of seismic surveys in Australia. The independent reviews have been shared with the authors of the McCauley et al. (2017) paper, and those authors have concurred with many of the shortcomings in study design and evaluation identified by the independent reviewers (IAGC, 2017). The IAGC (2017) concluded that the results of McCauley et al. (2017) showing patterns and trends do not actually exist in the data. Further, the results presented by McCauley et al. (2017) are of questionable scientific merit and, accordingly, must be subjected to more rigorous scientific study before being accepted as the "best available science" regarding the potential effects of seismic sound on zooplankton. Existing published studies demonstrating that any seismic effects on zooplankton occur only to tens of meters remain the best available science until the preliminary study by McCauley et al. (2017) can be properly replicated. Although the recent work by McCauley *et al.* (2017) and Richardson *et al.* (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. The evidence provided above is further detailed in the Environment Plan. From the best available research reviewed it is reasonably expected that squid and plankton will not be impacted at a population level. Squid are likely to respond behaviourally, while any impacts to plankton are likely to be temporary and recovery likely to be rapid. As such, the scientific evidence provided above assess the merit of the claim made by TSIC. The controls implemented to mitigate impacts to the squid fishery to as low as reasonably practicable are detailed in Appendix D and impacts to plankton can't be reasonably reduced further. For the TSIC Concern that the proposed MSS will have an adverse impact on finfish reproduction. Spectrum has provided the following analysis. There are limited studies examining the effects of seismic surveys on finfish reproduction, spawning and aggregation to spawn. However, there are several studies that have examined the overall effect to finfish fisheries which may be used as a proxy for the overall effect on the fishery. As discussed in Section 6.1.4.3 of the EP (Appendix E), fish may avoid areas of seismic activity and fish schools may disperse or change feeding behaviour patterns. A potential consequence of this is fewer fish are attracted to baited traps or hooks, or target species may follow prey species away from the area during the survey, thereby resulting in a temporary reduction in the catchability of commercially valuable species. An example of this is provided by Wardle *et al.* (2001) who used a video camera to document the behaviour of fish in response to noise levels equivalent or greater than those in the proposed survey. This study showed that the resident fish on the site did not evade the active source until it was within a few metres. No direct mortality was observed at sound levels of up to 218 dB (Lpk). Nevertheless, some fishers have expressed a belief that there is indeed a longer-term effect on fish catchability or presence in fished areas. This is difficult to determine given

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					the difficulty in separating possible seismic survey effects out from other factors such as fishing pressure, climatic changes and variation in natural population dynamics. A series of studies have been undertaken to determine the effects of seismic surveys on fish catches and distribution, primarily in the United States and Europe (e.g. California: Greene 1985, Pearson *et al.* 1992; Norway: Dalen and Knutsen 1987, Lokkeborg and Soldal 1993; and UK: Pickett *et al.* 1994). While the conclusions from these studies are largely ambiguous, due to the inherently high levels of variability in catch statistics, one study noted that pelagic species appear to disperse, resulting in a decrease in reported catches during the surveys (Dalen and Knutsen 1987). A study undertaken by the CSIRO and Geoscience Australia (Thomson et al. 2014) examined fisheries catches (ten species of interest) and catch rates for potential effects from 183 seismic surveys undertaken in the Gippsland Basin (Bass Strait). This study also found no clear or consistent relationships between seismic surveys and subsequent fisheries catch rates (Thomson et al. 2014). The scientific evidence provided above assess the merit of the claim made by TSIC. Since previous studies have not found detrimental effects more broadly to finfish fisheries, it is reasonable to expect that reproduction is unlikely to be affected to an extent that it is detrimental to the sustainability of the fishery. The controls that have been adopted to reduce impacts to finfish fisheries to as low as reasonably practicable are detailed in Appendix D (see Appendix G). For the TSIC Concern that the MSS will have adverse impact on benthic adult rock lobster and giant crab. Spectrum has provided the following updated response. With respect to berried females in the ensonified area, the study by Day et al. (2016a) reported no effects on embryos early in development within 1 to 1.5 km of the seismic source. Furthermore, the period during which females carry the eggs prior to release occurs from June to August, which is outside of the survey period, and many females will have released their eggs by the time the survey commences (i.e. hatching commences in September). Recent studies have investigated the impact of seismic sound on lobster embryos (Day et al. 2016b) and reported that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure (Day et al. 2016b). Although Day et al. (2016a) reported sub-lethal effects in field experiments, the study also highlighted potential adaptation of lobsters to statocyst damage and no ensuing impairment to righting reflexes (Day et al. 2016a). Previous to this study, laboratory based studies did not find effects on righting (turnover rates), with no differences observed between control and exposed animals to levels from 202 to 227 dB re 1 µPa (Payne et al. 2007). Further, one of the few studies to explore the issue of the effects of seismic on catch rates for lobster found no statistically significant correlative link between seismic surveys and changes in commercial rock lobster (Panulirus cygnus) catch rates associated with acute to mid-term mortality over a 26-year period in western Victoria (Parry and Gason 2006). The scientific evidence provided above assess the merit of the claim made by TSIC. As requested by TSIC, Spectrum have adopted controls to reduce seismic impacts to southern rock lobster and giant crab as detailed in Appendix D. The residual impact to these fauna has been reduced to as low as reasonably practicable with the adoption of these controls. For the TSIC Concern that November to January is the most important period of the year for spawning. Industry is concerned about the impact of seismic sound on reproduction and larvae, and subsequent recruitment. Spectrum has provided the following analysis. The objection to conducting the survey during November-January due to spawning by most species is a very general claim which is difficult to give a specific response. However, impacts to a range of species have been assessed in the following table (see Appendix G) which is from the Environment Plan. The scientific evidence provided assess the merit of the claim made by TSIC. This information has been used to adopt the controls outlined in Appendix D (Appendix G) to reduce the risks to rock lobster to as low as reasonably practicable. For the TSIC concern that Spectrum undertake regional study to quantify spatial/temporal impacts including water column testing for eggs/larvae of commercial species in order to develop a full biomass estimate (in particular for giant crab and rock lobster). Spectrum has provided the following response. The request to improve understanding of temporal and impacts on eggs and larvae is not a simple undertaking nor is there much certainty that the study would achieve the

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					objective. The cost, time and logistics of collecting sufficient amounts of data that could account for the inherently very large variability of such a system would take many years and millions of dollars and may still not yield meaningful results. If a study is as simple as suggested, it is difficult to understand why fisheries scientists have not already conducted such a study to better understand the population dynamics of target species. With the current level of scientific knowledge suggesting the risk of impacts is likely to be low, the cost and risk (of not obtaining meaningful results) of the suggested survey is grossly disproportionate to the potential gain and is therefore not considered ALARP. For the TSIC concern that fishers will lose access to fishing grounds and experience interference with fishing gear, Spectrum has provided the following response. Commercial and recreational fishers wishing to access particular fishing grounds may be temporarily displaced by the presence of the survey vessel and the streamers extending 8.1 km behind it. Fisheries reports and stakeholder feedback indicate that this overlap will primarily happen along the continental slope and shelf edge in waters between 150 – 1000 m deep. In assessing the spatial scale of this displacement it is important to note that the overall Survey Area is divided into smaller West, Central and South Acquisition Areas that will be surveyed independently (Figure 1). This reduces the effective displacement area as fishers will still be able to access other areas within the overall Survey Area. Figure 2 shows the Central Acquisition Area and indicative survey (sail) lines along which the survey vessel will steam whilst acquiring survey data. Most overlap with fishing habitat will occur in the north-western where the survey lines end and the vessel must undertake a wide turning circle to line up the next survey line. The Central Acquisition Area encompasses the main area of survey interest and as such cannot be modified without critically impacting survey objectives. Original plans for the South Acquisition Area also incurred overlap between survey and fishing areas along the continental slope. However discussion with crab fishers indicated that displacement and interference with fishing gear could be minimised if the south-easterly corner of this area was trimmed to avoid key fishing grounds (noting that crab fishers deployed traps to depths of 400 m). Spectrum subsequently altered survey plans for this area to accommodate this request, limiting the survey acquisition area to depths deeper than 800 m, as shown in Figure 3. This limitation also minimises overlap with fishers in the Commonwealth Scalefish Hook Sector who may fish continental slope waters to 800 m depth. This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to TSIC and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP			
Victorian Rock Lobster Association (VRLA) [redacted]	09/02/18 28/03/18 29/03/18 29/03/18 13/04/18 13/04/18 01/06/18	1st formal notification 1A General Phone call outgoing Email outgoing Phone call incoming (FLO) Phone call outgoing Email outgoing 2nd formal notification 2C Fisheries	Phone call with FLO 29/03/18: Advised that VRLA were aware of a number of proposed MSS, including the Dorigo MSS adjacent to the area proposed for Otway Deep MSS (3D Oil), and expressed concern about the cumulative effects. Recommended that SIV be consulted given that they would be involved in consultation for all the proposed MSS.	VRLA expressed concern about the cumulative impacts of the Dorrigo MSS and Otway Deep MSS occurring in adjacent areas. VRLA advised consulting with SIV. The VRLA's concerns regarding cumulative impacts on marine fauna is merited.	A cumulative impact assessment has been undertaken with regard to other potential seismic surveys planned in the area at the same time, and also has considered the potential longer-term effects from seismic surveys and potential for recovery of populations (Section 6.2). To avoid cumulative noise exposure Spectrum and 3D Oil have committed to avoiding discharging the airguns within 40km of each other if the timing of the Otway Deep MSS and Dorigo MSS overlap. Via phone call 29/03/18: FLO informed the VRLA that representatives from Spectrum were travelling to Melbourne to meet with SIV and the CFA the following week on the 5th of August. Further information will be communicated to relevant stakeholders as part of the ongoing consultation process and all stakeholders provided additional opportunities to respond with any new concerns
	01/02/19 01/02/19 06/02/19 06/02/19	3rd formal notification 3A General Email incoming Email outgoing Email incoming	Via email incoming 01/02/19: VRLA representative inquired as to whether the stakeholder update they had received was intended for VRLA or SIV. Via email incoming 06/02/19: VRLA representative informed Spectrum of the correct VRLA email address that had been cc'd to the email.		Via email outgoing 06/02/19: Spectrum informed the VRLA representative that the email was intended to be sent to the stakeholder as the president of the VRLA, however Spectrum is in consultation with SIV regarding this survey and are simply keeping VRLA informed regarding the new proposed timing of the survey and additional updates. Spectrum Geo will continue to liaise with SIV regarding consultation as well.
	14/03/19	Email outgoing	No response has been receive in response to the email outgoing sent to VRLA on the 14th March 2019.	No new objections claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation.	Via email outgoing 14/03/19: In response to the VRLA's comments raised regarding cumulative impacts of concurrent surveys sent on the 29th March 2018, Spectrum provided a detailed response covering the cumulative impacts, sequential surveys and impacts treatments to VRLA on the 14th March 2019.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
				Action: Respond to TRFLA's feedback (once received) to the email sent 14/03/19 in ongoing consultation	Cumulative impacts: Potential cumulative impacts associated with the Spectrum Otway Deep MSS (MSS) may occur if: the survey is undertaken at the same time as another seismic survey within the area, there is an overlap in the areas ensonified by each survey and there are noise sensitive receptors in the overlap zone (concurrent surveys) the survey is undertaken within an area where previous seismic surveys have occurred, the affected marine biota are still in the same area and have not fully recovered (sequential surveys). All currently submitted and approved EPs for seismic surveys have been investigated on the NOPSEMA website and those with potential spatial and temporal overlap with the MSS have been assessed for cumulative noise impacts. There are no other seismic surveys planned (EP submitted or accepted) that overlap with the MSS survey or operational areas. However, it is noted that until the MSS EP is approved and scheduling for the MSS finalised, it is not yet possible to determine which other seismic surveys will be in progress at the time. The Dorigo MSS is being planned by 3D Oil and the operational area is to the east of the Otway Deep operational area and west of King Island. Spectrum has requested to be kept updated on the progress of 3D Oil's Dorrigo MSS activities, who have similarly requested Spectrum ensure 3D Oil is kept updated as planning for the Otway Deep MSS progresses. Spectrum plans to maintain a close dialogue with 3D Oil and will implement a separation distance of 40 km between the two vessels in the event of concurrent operations. This is based on the recommendations of the Bureau of Ocean Energy Management that maintaining a 40 km geographic separation distance between active seismic vessels would minimise cumulative impacts to marine life. JASCO modelled cumulative seismic sound levels for the Otway Deep 3,475 in^3 source and the 3D Oil 3,260 in^3 source and calculated received sound levels at several points of interest (Figure 6.5). The maximum sound level at a point midway between two active seismic sources (20 km from each) was predicted to be <150 dB re 1µPa. Further, the received sound levels at the edge of the southern right whale BIA would be a maximum of 122.5 dB re 1µPa. These levels are well below the level which may elicit avoidance behaviour in cetaceans which are the only marine fauna possibly affected over such large distances. The conservative 40 km buffer between seismic vessels will therefore keep sound levels below the level at which physiological impacts could occur. CONOPS will be prepared at least one month prior to the planned survey commencement (where necessary) and the seismic vessel will adhere to specific CONOPS procedures when operating within the Cautionary Zone around another the other vessel. No cumulative impacts are predicted from concurrent surveys. If a survey is permitted within 40 km of the Otway Deep survey area, and scheduling for both surveys may overlap, the relevant titleholder will be contacted, and arrangements made to ensure that the potential cumulative impacts will be reduced to ALARP. As a minimum, Spectrum will not acquire seismic data within 40 km of another actively acquiring seismic vessel. Given the very low probability of two seismic surveys occurring simultaneously and the controls that will be implemented to establish and maintain communications prior to and during the survey to ensure such simultaneous activities would maintain an adequate separation distance (40 km), there is very little risk of cumulative impacts to marine receptors. Sequential surveys Cumulative impacts can occur when the timing between activities is less than the recovery rate of any potential impacts to receptors. The US National Marine Fisheries Service (NMFS) applies a "resetting" of SELcum after 12 hours of non-exposure. Whereby, if there is a 12-hour period between the end of one pile driving operation and the start of the next, the SELcum for a fish during the pile driving operation is reset to zero for the next set of exposures. Applying a pile-driving management measure to a seismic survey is highly conservative, given the much lower number of sound pulses associated with seismic surveys and the ability of most fish and other receptors to move away from the source. The seismic vessel will take between 6.5 to 16 hours to travel along a survey line, where it will then carry out its turning procedure (approximately 4.5 hours) and travel back along a line that is typically between 8 to 12 km away from the preceding sail line.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					It will therefore be 12-24 hours before an adjacent area (distance away based on the size of the array spread) is acquired, ensuring negligible cumulative impacts resulting from consecutive sail-lines during the Otway Deep survey. Where long-lived and resident receptors have been impacted and are still present in the impact area during a subsequent survey, multiple exposures may be possible. The objective of the Otway Deep MSS is to tie in with existing historical 3D survey data, and there have been no previous seismic surveys over the Otway Deep survey area since 2015. Due to the period of time between surveys it is expected that there is no lasting impact to the Otway Deep survey area as a result of previous seismic surveys (i.e. full recovery has occurred); and therefore, there will be no sequential (or additive) effect as a result of the Otway Deep MSS. Spectrum propose to carry out the surveys over two seasons, however the same area would not be surveyed again from one season to the next, and the potential for cumulative effects would limited to potential overlaps in areas of ensonification. However, based on individual fish recovery times proposed by Stadler and Woodbury (2009) of 12 hours, this indicates that it is highly unlikely that individual fish in an area where a seismic survey was acquired 1-2 years ago would not have recovered over this time. Populations would be more resilient due to immigration and recruitment of unaffected individuals. In addition, recent work has shown that fish can recover from the startle response of acoustic disturbance within minutes and that repeated exposure can lead to habituation and reduced response within weeks. Based on the above, no cumulative impacts from sequential seismic surveys are predicted for the Otway Deep MSS. Impact Treatment The residual impacts are considered Acceptable because they are less than the levels of acceptability set for the activity. This is considered a reasonable demonstration of acceptability because the pre-set levels are conservative and take into account uncertainties as appropriate. Spectrum provided the demonstration of acceptability table directly from the EP Section 6.1.2
		Ongoing consultation: Spectrum will continue to provide project updates to VRLA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Victorian Recreational Fishers Association (VRFish) [redacted]	09/02/18 28/03/18 11/06/18 23/07/18 23/07/18	1st formal notification 1A General Phone call outgoing (FLO) 2nd formal notification 2A General Phone call outgoing (FLO) Email outgoing	No feedback provided in response to the first or second stakeholder consultation letters. Via phone call 28/03/18: FLO phoned and left a message introducing himself and asked [redacted] to read the consultation letter provided and call back if he had any comments. Via phone call outgoing 23/07/18 Expressed concern about access to fishing grounds while vessel is in the area. Mentioned that tuna is a targeted species however understands that they are not spawning in this area. No response received in response to the 2nd and 3rd formal notifications sent to VRFish.	VRFish expressed concerns about access to fishing grounds and about impacts to tuna. Spectrum have already addressed these issues in the second stakeholder consultation letter that was provided twice to VRFish. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Access to fishing grounds: Spectrum appreciates the importance of the tuna fishery to recreational fishers. Spectrum notes that it agrees to compensate fishers for equipment that is damaged beyond repair and cannot be re-used as a direct consequence of survey activities. However, compensation due to loss of a fishery is not a reasonable request to consider given the additional control measures in place to minimise displacement of fishers, the inherent variability in abundance of commercial fish species, and reasonable expectation that fishers can utilise alternative fishing grounds in the short term. Via email 23/07/18: Spectrum followed up with an email attaching the second stakeholder consultation letter again and encouraged feedback on the proposal.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to VRLA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Warrnambool Professional Fisherman's Association (WPFA)	09/02/18 01/06/18 01/02/19	1st formal notification 1A General 2nd formal notification 2C Fisheries 3rd formal notification 3A General	No response received regarding the 1st, 2nd and 3rd formal notifications sent to WPFA on the 9th February and 1st June 2018, and 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	07/03/19 07/03/19	Phone call outgoing Email outgoing	Via phone call outgoing 07/03/19: WPFA representative stated that they are unsure if they have seen the information however feel they will be affected by the proposed survey. Provided a new email address for information to be sent through to. WPFA representative stated they would be in touch with Spectrum if they have any concerns and they will also inform their members of the proposed survey.	The WPFA's comments stating they think they will be affected but will need to look at the information to determine if they are is merited. Merited as the stakeholder does not yet know if they will be affected and therefore cannot make objections. Action: Spectrum to re-send the consultation material through to the WPFA in order for the association to make an informed decision that they will or will not be affected by the proposed survey	Via phone call outgoing 07/03/19: Spectrum followed up with the WPFA to determine if the association had been receiving the consultation material that Spectrum has sent through. Spectrum stated they will send through the latest consultation material to the new email address provided. Via email outgoing 07/03/19: Spectrum provided WPFA with a follow up email documenting the phone call from earlier in the day. Spectrum further indicated to WPFA that if they have any concerns and if/how they perceive they will be affected to please inform Spectrum. Spectrum reiterated that WPFA will continue to receive updates regarding the proposed survey unless they indicate they are not going to be affected by the proposal. Spectrum considers WPFA a relevant stakeholder and will continue to update them on the progress of the proposed Otway Deep MSS.
		Ongoing consultation: Spectrum will continue to provide project updates to WPFA and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Fishing companies and fishers					
[redacted] operator/ licence holders: Tasmanian Giant Crab Fisher and Southern And Eastern Scalefish And Shark Fisher, Commonwealth Trawl Sector Fisher [redacted]	09/02/18 14/02/18 28/03/18 29/03/18	1st formal notification 1A General 1st formal notification 1A General Phone call outgoing (FLO) Meeting (FLO)	No feedback received in response to the first stakeholder consultation letters. Via phone call 28/03/18: During phone call with FLO, licence holder confirmed he had received project information but was not certain what it was. Via meeting 29/03/18: During meeting with FLO, licence holder expressed general concern about the proposal commenting that everybody knows seismic surveys ruin fish stocks and the survey will ruin their year. He briefly described the ownership entities of the boat, commercial arrangements and quota he fished. He recommended contact with majority owner of [redacted].	The part owner of [redacted] claimed that seismic surveys ruin fish stocks and will ruin the fishers' year. The part owner of [redacted] claims regarding the impacts the noise has on fish stocks is merited do to potential disruption by the survey. Action: Spectrum to address stakeholder claims regarding the impacts of seismic surveys on fish stocks. Action: Spectrum had already engaged with majority owner of [redacted], however will arrange for a meeting with both stakeholders to address their concerns together.	Via phone call 28/03/18: FLO attended Portland Wharf for informal introductory meetings about the proposal and met with licence holder's assistant. They phoned the licence holder and FLO introduced himself and asked if he received any project information. Via meeting 29/03/18: FLO attended Portland Wharf to meet with licence holder and discuss any concerns they had with the proposal. Spectrum had previously notified the majority owner of the [redacted] (09/02/18 and 14/02/18). The FLO contacted them and arranged a conference call on 12/04/18. Following further consultation with these stakeholders, Spectrum subsequently prepared a consultation letter that contained a summary of the impact assessment for the survey on the giant crab and finfish fisheries and the control measures in place to reduce impacts to ALARP. The consultation and information provided is covered in the rows below.
	07/04/18 12/04/18 12/04/18 01/06/18	Email outgoing (FLO) Email outgoing (FLO) Conference call 2nd formal notification 2C Fisheries	Via conference call 12/04/18 (Spectrum, FLO, [redacted] and [redacted]): Stakeholders present asked queries about the proposal and discussed the following key issues: location and placement of OBNs displacement of fishing operations research findings on impacts to larvae impacts to spawning during closed season. They requested further information when available.	Stakeholders voiced concerns about the location of the OBNs, displacement of fishers, the impacts of seismic surveys on planktonic larvae and impacts to spawning during the closed season. The stakeholders concerns regarding the impacts of seismic surveys on planktonic larvae and impacts to spawning during the closed season are merited. Action: Spectrum to respond to stakeholder concerns and provide further information when it is available.	Via emails 07/04/18 and 12/04/18: Spectrum provided high-resolution maps and the first stakeholder consultation letter again to both vessel owners. The also stated that Spectrum are seeking ways to mitigate adverse interactions with other users of the area and that their feedback would be greatly appreciated. Via conference call 12/04/18 (Spectrum, FLO, [redacted] and [redacted]): Spectrum stated that the OBNs would be placed on non-trawled areas noting that efforts to seek details of fishing locations were ongoing. Explained that an acoustic release would be used to recover the OBNs with only the concrete ballast remaining on the seafloor. One month prior to the commencement of the survey, Spectrum will agree and confirm locations for deployment of OBNs with relevant fishers operating within the Activity Environment that Might Be Affected (EMBA). Spectrum have since considered the location and timing of the survey in relation to giant crab areas and following further consultation with crab fishers and has moved the south-eastern boundary of the survey area further offshore outside giant crab biological depth range. Spectrum reviewed the recent literature published on the effects of seismic on zooplankton and have addressed the implications of the findings the study by McCauley et al (2017), as well as the subsequent CSIRO study on the impacts of seismic on zooplankton (Richardson *et al.* 2017) in the EP. McCauley et al. (2017) reported zooplankton mortality rates more than two orders of magnitude higher than recorded in earlier studies. They found that exposure to a 150 in3 airgun shot significantly decreased zooplankton abundance and that the mortality rate increased from a natural rate of 19% per day to 45% per day (McCauley et al. 2017). Impacts were detected out to edge of the study area, at 1.2 km from the airgun in waters 34 to 36 m deep (McCauley et al. 2017); these water depths are considerably shallower than the majority of seismic surveys in Australia. In response to the McCauley et al. (2017) study, CSIRO modelled the impacts on zooplankton from a 35-day seismic survey in 300 to 800 m deep water in an 80 km x 36 km survey area (Richardson et al. 2017).

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Within the survey area, the model predicted a 22% reduction in zooplankton biomass, which declined to 14% within 15 km of the survey area (Richardson et al. 2017). They modelled the recovery of the plankton population and found it returned to 95% of the original biomass level within three days after the end of the survey. The rapid recovery was attributed to the fast growth rates of zooplankton and the dispersal and mixing of zooplankton from inside and outside the impacted area (Richardson et al. 2017). The Bonney Coast is an area of known high primary productivity during periods of upwelling, however it lies 24.5 km from the survey area at its closest point and is therefore outside of the predicted area of ensonification for effects on plankton from seismic sound. McCauley et al. (2017) reported significant decreases in abundance and increase mortality rates in zooplankton, but their study area was in very shallow waters compared to Otway Deep MSS, which lies in water depths of 170 to 3,600 m. Richardson et al. (2017) agreed that McCauley et al. (2017) found evidence of some local-scale impact of seismic activity on zooplankton but also noted that their modelled impacts may have been over-estimated due to diel vertical migration which was not included in their model. Notwithstanding, they predicted recovery of the zooplankton community within three days after the end of the seismic survey. Spectrum stated that the spawning periods for all key fisheries species, including giant crab were being considered in the EP impact assessment and stated this information would be provided to them. Via email 01/06/18: Spectrum provided the second stakeholder consultation letter that contained a summary of the impact assessment for fisheries, including impacts to the giant crab fishery, and the control measures adopted by Spectrum to reduce impacts.
	30/06/18 06/07/18 27/07/18 03/08/18	Meeting (FLO) Meeting (FLO) Email outgoing Phone call outgoing (FLO)	Via meeting 30/06/18: Licence holder advised FLO of concerns surrounding damage to gear and fears of damage to crab stocks. Raised actions for seeing enduring arrangements to prevent the decimation of this business and advised FLO that they are fishing with ropes double the depth in which the pots are set. Via meeting 06/07/18: Licence holder advised Spectrum they are fundamentally opposed to seismic surveys and may sabotage any seismic activities carried out in Victoria and Tasmania. Noted that bathymetry charts are inadequate in determining where crabs inhabit. Licence holder stated that any seismic sound that is emitted near giant crab areas will send them away and ruin his catch. Via phone call 03/08/18: [redacted] advised FLO that compensation was required to the giant grab fishermen for this survey to go ahead. He said that all the crab fishermen were outraged, and the issue was going to be pursued in the supreme court. He advised that he does not wish to be contacted by Spectrum in the ongoing consultation process.	Operator of [redacted] and licence holder for giant crab fishery stated they fundamentally object to seismic surveys and claimed that seismic sound would reduce catch if it occurred near giant crab fishing areas. Stakeholder also expressed concerns about damage to gear and to fishing stocks. The stakeholder concerns regarding reduction to catch rates and potential damage to gear and fish stocks are merited. Action: Spectrum to address stakeholder claims regarding the impact of seismic sound on catch and potential damage to gear and to stocks. Spectrum has removed [redacted] from distribution lists. He is still a relevant stakeholder but will not be contacted as requested.	Via meeting 30/06/18: FLO met with licence holder. FLO noted that Spectrum were considering trimming the south-eastern corner of the survey area. Spectrum have since considered the location and timing of the survey in relation to giant crab areas and following further consultation with crab fishers and has moved the south-eastern boundary of the survey area further offshore outside giant crab biological depth range. Spectrum has agreed to compensate fishers for equipment that is damaged beyond repair and cannot be re-used as a direct consequence of survey activities. A control measure is in the EP for this and was included in the stakeholder consultation letter sent on 01/06/18. Via meeting 06/07/18: Spectrum met with operator of [redacted] and major licence holder for giant crab fishery. Spectrum have since considered the location and timing of the survey in relation to giant crab areas and following further consultation with crab fishers and has moved the south-eastern boundary of the survey area further offshore outside giant crab biological depth range. Via email 27/07/18: Spectrum emailed [redacted] to thank him for meeting previously. Provided maps and second stakeholder consultation letter again. Stated they understood that [redacted] was not supportive of the project but that if he changed his mind and wanted to discuss the potential impacts of the survey to get in touch. Spectrum also notified him that they had trimmed the south-eastern corner of the survey area and that as per industry standard they would notify him four weeks prior to commencement of the survey. Via phone call 03/08/18: FLO contacted licence holder for the giant crab fishery to seek feedback on the revised survey area. [redacted] and [redacted] are considered relevant stakeholders. Spectrum will continue to consult [redacted] but will not make contact with [redacted] with the exception of the four week notification.
	01/02/19 14/02/19	3rd Formal Notification 3A General	No feedback has been received in response to the 3rd formal notification sent to [redacted] on the 1st February 2019.	No new objections or claims. No action required.	[redacted] is a relevant stakeholder and will continue to receive project updates from Spectrum. Spectrum will not make contact with [redacted] with the exception of the four week notification.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	14/02/19	Phone call outgoing Email outgoing			
	14/03/19	Email outgoing	No repose has been received in response to the email outgoing sent to [redacted] and [redacted] on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to [redacted] and [redacted] feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via phone call outgoing 14/02/19: Spectrum attempted to contact stakeholder to discuss updates to the proposed survey and any concerns they may have. No answer, Spectrum left a message with contact details. Via email outgoing 14/02/19: Spectrum followed up the phone call with an email informing the stakeholder that they had attempted to contact them, and again provided contact details. Via email outgoing 14/03/19: Spectrum provided a follow up to conversations beginning 11/05/18 and a response to concerns raised in emails of 30/06/18 and phone calls on 03/08/18. The concerns raised included the potential damage to fishing gear and impacts to crab stock. Spectrum supplied information regarding the change to the survey area was communicated previously and addressed the specific concerns. Access to Fishing Grounds and Interference with Fishing Gear: commercial and recreational fishers wishing to access fishing grounds may be temporarily displaced by the survey vessel and its streamers. Overlap will primarily happen along the continental slope and shelf edge in waters of 150-1000m depth. Effective displacement will be reduced due to the Survey Area being divided into smaller Acquisition Areas. Consultation with crab fishers lead to the trimming of the south-eastern part of survey area to minimise displacement and interference with finishing gear. Potential Impacts to Giant Crab stocks: The area of giant crab habitat within the survey area that may be exposed to sound levels above the sub-lethal level as described by Day et al. (2016) is 319 km^2. Adult giant crabs undertake seasonal movements and as a result, females may move to depths of <260m during summer whereas males stay deeper reducing crab biomass exposed to seismic sound (Levings 2008). Conservative sound modelling results for the Otway Deep MSS predicts potential sub-lethal effects in giant crabs between 175 and 260 m from the seismic source (Day et al. 2016). Infill or completing gaps in sail lines after initial seismic data acquisition will occur at a minimum >24 hours after first exposure. Spawning of giant crab occurs outside of the survey period and so the impact of the survey on reproduction is expected to be minor. Studies show minor impact on planktonic life stage due to dispersal by current (Richardson et al. 2017) Potential impacts to the Victorian Giant Crab Fishery from seismic sound: The amount of target habitat that may be exposed to sound levels above the 209 dB threshold for invertebrates comprises 16.6% of the total fishing area. Overlap between the ensonified and fished areas is not expected to impact the catch of giant crab fishers due to the expected negligible impact of seismic sound on individual giant crabs. The survey vessel will only be acquiring data in water depths of 400 m or less for a total of 8 days throughout the entire survey season (inclusive of line turns and part days rounded up). Potential impacts to the Victorian Giant Crab Fishery from physical displacement: The amount of potential fishing area within the Giant Crab Fishery that overlaps the survey operational area is 1,302 km^2 (68% of fishing area). Overlap between individual survey swaths and the fishery are much smaller than the overall overlap of the operational area. The Central Acquisition Area, where disruption is most likely, is oriented so they only overlap small areas of the continental slope (between 2.1-16.6% and average 6.9%). 16 day overlap between start of the open season Victorian Giant Crab Fishery and survey. Potential disruption to be minimised through advanced notification of the swath the survey vessel will be operating in.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Impacts to commercial fisheries as a consequence of the physical presence of the survey vessel are expected to be minor. Proposed control measures to minimise potential impacts of seismic activities on fisheries: Spectrum will notify relevant persons four weeks prior to the start of the survey Fishers actively operating in the survey area will be issued a 7 to 10 day forecast prior to activities commencing in the survey area and will be kept informed of daily activity through Spectrum's 24-hour look-ahead communication process. Spectrum will continue to advise relevant fishers of planned sail lines and dates. Spectre will make reasonable effort to avoid or minimise conflict if issues are raised by fishing stakeholders. A support vessel will accompany the survey vessel and manage interactions with streamers and other vessels. Spectrum will pay compensation to the rightful owner of any fishing equipment damaged or lost as a consequence of survey activities, along with associated loss of catch for the fishing trip in which loss.
		Ongoing consultation: [redacted] is a relevant stakeholder and will continue to receive project updates from Spectrum. Spectrum will not make contact with [redacted] with the exception of the four week notification in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Trawl Sector Fisher	27/02/18 04/07/18 08/08/18 08/08/18 09/08/18 20/08/18 31/08/18 04/09/18	1st formal notification 1A General 2nd formal notification 2C Fisheries Email outgoing Email incoming Email incoming Email outgoing Email incoming Email outgoing	No feedback received in response to stakeholder consultation letters. Via email 08/08/18: Stakeholder stated that they would check the locations and get back to Spectrum with feedback. Via email 09/08/18: [redacted] provided feedback that only OBN 4 and 5 would have an effect on their fishing grounds. Via email 31/08/18: Stakeholder provided coordinates for the foul grounds to assist Spectrum in locating the OBNs where fishing activities will not be affected.	[redacted] provided feedback and on OBN locations as well as the potential impact that could be felt from the OBN placement. [redacted] comments regarding OBN locations are merited due to potential disruption to fishing activity.	Via email outgoing 08/08/18: Spectrum sought input on proposed locations of the OBNs. Provided image with dimensions of the OBN unit and map, along with a description of the deployment and recovery of OBNs. Via email 20/08/18: Spectrum requested feedback on the location of foul ground within the area suitable for the OBNs and provided a map with the OBN locations plotted. Via email 04/09/18: Spectrum revised the location of the OBNs in response to [redacted] feedback and other stakeholder feedback and thanked [redacted] for his input. Spectrum stated they would inform him if there are any plans to change the locations for some reason. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 05/02/19 13/02/19 13/02/19 13/02/19	3rd formal notification 3A General 3rd formal notification 3A General Phone call outgoing Email outgoing Email incoming	Via phone call 13/02/19: The stakeholder identified that they are likely affected. Stakeholder was unsure of receipt of stakeholder consultation letter and provided updated contact details to Spectrum. Stakeholder agreed to additional contact. Via email 13/02/19: [redacted] replied to confirm receipt of stakeholder consultation letter.	No new objections or claims, stakeholder updated contact details. Action: Spectrum to send update again to new contact details and call stakeholder after they have had time to discuss the stakeholder newsletter.	Via phone call 13/02/19: Spectrum called [redacted] to discuss stakeholder consultation letter and planned surveys. Spectrum agreed to resend information and get back in contact early next week once they had had time to familiarise with the information. Via email 13/02/19: Spectrum confirmed phone conversation and send stakeholder letter to new contact details.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher, Commonwealth Trawl Sector Fisher [redacted]	12/04/18 19/04/18 01/06/18	1st formal notification 1A General Email incoming 2nd formal notification 2C Fisheries	Via email 19/04/18: In response to Spectrum's first stakeholder consultation letter, [redacted] advised that the survey area includes their area of operation (the FLO notes that [redacted] operate two trawl vessels and fish off the west coast of Tasmania, including King Island). [redacted] expressed concern about the effect on the catchability of fish and the lasting effects of "dead fishing grounds" for up to four months after the survey. They requested further information on: the volume of trawl catch taken from the proposed area stocks in the proposed area value of this fish seasonality of catch. [redacted] noted that long-term averages would be required to assess how the seismic survey impacts the above.	[redacted] noted the survey area overlaps their area of operations and expressed concerns that the survey would affect their catch for up to four months after the survey and therefore their livelihood and concerned about the ecological impacts of seismic surveys. [redacted] requested further information from Spectrum and a follow-up conversation about the timing of the survey. The [redacted] concerns regarding catchability of fish, flow on effects of the survey on their livelihood and ecological impacts of seismic surveys are merited. The [redacted] request for additional information and a follow up conversation with Spectrum regarding the survey are merited.	Via email 01/06/18: In response to [redacted] concerns, Spectrum ensured the second stakeholder consultation letter contained the information they requested and in response to the concerns they raised. The letter contained a summary of the impact assessment on the potential impacts identified for the SESSF CTS and the control measures proposed to reduce them. The letter also included a request for additional information on fishing activities within the Activity EMBA, that could further inform the impact assessment and control measures adopted. Details on the volume of trawl catch, stocks, value of the fish and seasonality of the catch were not included in the letter provided since that information is not relevant to [redacted] functions, interests and activities as an individual operator. No response to the second formal notification has been received from [redacted]. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process and will notify them at least four weeks prior to the survey commencing.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			Noted concern about the ecological impacts of seismic surveys citing Australian research showing serious effects on plankton, scallops and crayfish. [redacted] requested a follow up conversation regarding the best timing for the survey once this information was available and requested that their comments be recorded in the EP. [redacted] requested confirmation that their correspondence would be included in the EP.	Action: Spectrum to provide further information to [redacted] on the concerns they raised.	In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to larvae and plankton (incl. eggs) The potential impacts of seismic surveys on plankton will depend on the species in question, the life history stages, the specifications of the airgun array, the distance between the airgun discharge and the plankton, the number of discharges, the water depth and the seabed features. Proximity to the source (i.e. airgun array) will also be variable due to diel migration of plankton (including larvae) between surface and deep waters. Consequently, predicting impacts is difficult due not only to the diversity of organism in the plankton but to the variation in environmental and physical parameters, even within the timeframe of a seismic survey. Although the recent work by McCauley et al. (2017) and Richardson et al. (2017) suggests that the zone of impact for zooplankton may be two orders of magnitude higher than previously thought, there is still evidence that for certain components of the plankton effects are likely to be limited to <10 m. Further, for many components of the zooplankton and phytoplankton, recovery is expected to be rapid (in the order of days), so the effects expected to be limited and to be within the range of natural variability. Scallops Commercial scallops are mainly found at depths of 10-20 m but may also occur down to 60 m, which is shallower than the water depths of the Otway Deep MSS (175 to 3,600 m). Therefore, commercially fish scallops and wild stock scallops will not be affected by the survey due to spatial separation and do not require further assessment in this EP. Crayfish/Lobster There is no spatial overlap between the lobster habitat and the area that will be ensonified at levels above those which have been shown to affect lobsters. Spawning generally occurs in waters shallower than where the survey will occur with larval dispersal occurring over a very large spatial area. As a result of the factors described above, the survey is extremely unlikely to have effects on lobsters, the catch or their recruitment into the fishery. Day et al. (2016a) assessed the impact of seismic sound on buried rock lobster. Exposure to the maximum measured SPL of 209 to 212 dB re 1µPa (Lpk-pk) did not result in mortality of any adult lobsters or a reduction in the quantity or quality of larvae.
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted] on the 1st February 2019.	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	14/03/19	Email outgoing	No repose has been received in response to the email outgoing sent to [redacted] on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to [redacted] feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19 Spectrum provided a follow up to queries and conversations received via [redacted] on 19/05/18. Queries concerned trawl catch and value as well as the impacts of seismic noise on plankton and crustaceans. The letter contained a summary of potential displacement for each commercial fishery explaining that fishing depth was also used to calculate the value. The potential fishing areas within the operation area range from 481 km^2 for the Squid Jig Fishery and 3,236 km^2 for the Scalefish Hook Sector. However, the broad depth range and large geographic extent of the Scalefish Hook Sector means only 0.1% of the overall potential fishing area is within the operational area or the survey. For the other Commonwealth fisheries, the potential fishing areas within the operational area range from 0.2 to 5.5%. All the Commonwealth fisheries operate year-round, and catches are taken over a broad area.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	03/07/18 10/07/18 10/07/18 01/02/19	2nd formal notification Fisheries	No feedback or response received in response to the 2nd formal notification.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Phone call outgoing Email outgoing (included 2nd formal notification 2C Fisheries) 3rd formal notification 3A General			
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher	30/07/18 01/08/18 03/08/18 01/02/19	2nd formal notification 2C Fisheries Phone call outgoing Email outgoing (included 2nd formal notification) 3rd formal notification 3A General	No feedback or response received in response to the 2nd formal notification, phone call outgoing, email outgoing and 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher	05/02/19 18/02/19 18/02/19 18/02/19 01/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Phone call outgoing Email outgoing Phone call outgoing	Via phone call outgoing 18/02/19: Stakeholder answered phone call but was unsure of who should be contacted or what the call was about. The stakeholder requested Spectrum's contact details and the consultation package to be resent. Via phone call outgoing 01/03/19: During Spectrum's follow up call the Stakeholder said they had previously stated all questions were to go to Tuna Australia and ended the call.	Action: Respond to [redacted] to ensure the stakeholder understood that it was the Otway Deep MSS discussed.	Via phone call outgoing 18/02/19: Spectrum called but there was no answer, a voice to text message was left. Via email outgoing 18/02/19: Spectrum provided a follow up email to the phone call. The email provided a record of the call, Spectrum's contact details and the consultation package. Spectrum also said a call would be made if no contact was received. Via phone call 01/03/19: Spectrum called to follow up the earlier email re-sending the consultation letter. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Vic Giant Crab Fisher Tas Giant Crab Fisher	04/07/18 01/02/19	2nd formal notification 2C Fishers 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notification sent to [redacted] on the 4th July 2018 and 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher	27/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted] on the 27th February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Vic Rock Lobster Fishery	10/07/18 10/07/18 19/07/18	Phone call outgoing Phone call outgoing Phone call outgoing	No feedback or response received in response to the phone calls outgoing to [redacted] on the 10th July, and 19th July 2018.	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call outgoing 10/07/18: Spectrum attempted to contact the stakeholder twice to acquire an email address to which the consultation information could be sent. No answer but messages were left. Via phone call outgoing 19/07/18: Spectrum attempted to contact the stakeholder for the third time. No answer but a message was left. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Commonwealth Shark Gillnet Sector	04/07/18 01/02/19	2nd formal notification 2C Fishers 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notifications sent to [redacted] on the 4th July 2018 and 2nd February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Cth Southern And Eastern Scalefish And Shark Fisher, Gillnet, Hook and Trap Sector, Scalefish Hook Sector	11/06/18	2nd formal notification 2A General	No feedback or response received in response to the 2nd formal notification sent to [redacted], on 11th June 2018.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 18/02/19 18/02/19 18/02/19	3rd formal notification 3A General Phone call outgoing 3rd formal notification 3A General Email incoming	Via phone 18/02/19: Stakeholder advised not sure if received stakeholder update. Advised is on holiday until 25/02/19 and will respond after that date. Requested another copy of the update and a call back. Information was sent to two email addresses provided, one bounced back.	Stakeholder requested information and a call back. Stakeholder's request for information and a follow up call with Spectrum regarding the update are merited due to stakeholder not seeing the most recent update. Spectrum resent information to stakeholder and call stakeholder back.	Via email 18/02/19: Spectrum provided consultation update again to stakeholder and confirmed will contact again after their holidays.
	06/03/19 06/03/19 06/03/19	Phone call outgoing Email outgoing Phone call outgoing	Via email 06/03/19: Email to Stakeholder documenting phone call stakeholder update. Stakeholder suggested we talk to another contact, one of his staff, to confirm whether he will be affected. Via phone 06/03/19: Stakeholder provided contact details for the second contact (the skipper)	Stakeholder provided new contact information for stakeholder. The information is merited. Action: Spectrum to contact the second contact provided regarding the survey.	Via email 06/03/19: Spectrum documented phone conversation with stakeholder. Received additional stakeholder contact information.
	07/03/19 07/03/19 07/03/19	Phone call outgoing Email outgoing Email outgoing	Via phone call 07/03/19: The skipper asked for more details regarding the area of survey and indicated their activities would not be affected. He raised concerns regarding the shark migratory path on the shelf edge.	The skipper requested further information on the area of survey the impact on shark migratory routes The skipper indicated their activities would not be affected by the survey. The request for further information is merited for the stakeholder to understand whether their fishing activities would be disrupted by the survey. Action: Spectrum to email the skipper the requested additional information.	Via phone 07/03/19: Spectrum agreed to provide more information on the area of survey and address the skippers concerns regarding shark migratory routes in a following email. Via email 07/03/19: Spectrum emailed stakeholder to confirm contact details of the skipper, document the phone conversation and confirm that the issue of shark migratory routes has been raised in consultation and changes have been made to the EP. Via email 07/03/19: Spectrum emailed the skipper to provide additional information as requested and confirm will not be in further contact unless requested. This stakeholder is considered not relevant and will not be updated further unless requested. Stakeholder no longer considered relevant as they do not fish in or near the survey area.
.		Ongoing consultation: Spectrum will not continue to provide project updates to stakeholder unless requested in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	11/06/18 01/08/18 01/02/19	2nd formal notification 2A General Phone call outgoing 3rd formal notification 3A General	No feedback or response received in response to the 2nd formal notification, phone call outgoing and 3rd formal notification sent to [redacted] on 11th June and 1st August 2018 and 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 01/08/18: Spectrum attempted to call stakeholder to discuss the proposed survey and any concerns they may have. No answer, contact details left. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher	11/06/18 01/08/18 01/08/18 01/02/19 14/03/19	2nd formal notification 2A General Phone call outgoing (FLO) Email outgoing (FLO)	Via phone 01/08/19: The individual stated that they do not know [redacted], but provided contact details for someone who may.	Contact details of stakeholder require assessment for currency. Action: Spectrum to obtain current contact information for stakeholder.	Via phone call 01/08/18: FLO called the stakeholder to introduce themselves and discuss the proposed survey. Via email 01/08/18: FLO emailed the contact supplied in the phone call (01/08/18) to enquire after [redacted]. No reply has been received. Spectrum later obtained current contact details for the stakeholder via fisher licence details supplied by AFMA. Via 1st formal notification 01/02/19 and 14/03/19:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		1st formal notification 1D new AFMA fishers			Spectrum provided the stakeholder with the latest update to the survey area as well as the stakeholder package sent to all new AFMA fishers.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Cth Southern And Eastern Scalefish And Shark Fisher Gillnet, Hook and Trap Sector Scalefish Hook Sector [redacted]	11/06/18 01/02/19	2nd formal notification 2A General 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notification sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Squid Jig FIshery	30/07/18 01/08/18 03/08/18 01/02/19	2nd formal notification 2C Fisheries Phone call outgoing (FLO) Email outgoing (FLO) 3rd formal notification 3A General	No feedback or response received in response to the 2nd formal notification, Phone call outgoing, Email outgoing and 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 03/08/18: FLO attempted to contact the stakeholder to introduce themselves and discuss the proposed survey. No answer, contact details left. Via email 03/08/18: FLO send the 2nd formal notification 2C Fishers and question template to a second stakeholder contact. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted] **Refer to [redacted] regarding consultation following 01/08/18**	11/06/18 25/06/18 03/07/18 01/08/18	2nd formal notification 2A General Phone call incoming (FLO) 2nd formal notification 2A General Phone call outgoing (FLO)	No feedback received in response to the first stakeholder consultation letter posted. Via phone call (FLO) 25/06/18: [redacted] advised FLO of their concerns regarding the survey scaring away squid. Advised FLO of their months of operation being outside the survey period. Via phone call 01/08/18: [redacted] advised that all owners of [redacted] were very concerned about the survey and had engaged AFMA board member [redacted] of [redacted] to deal with this.	[redacted] raised concern regarding squid being scared off from the area by seismic surveys in response to second notification. [redacted] concerns regarding the impacts of seismic noise on squid are merited due to their squid fishing activity in the survey area. Action: Spectrum agreed via phone call to address [redacted]' concerns raised in their phone call on 25/06/18 via [redacted].	Via phone call 25/06/18: Spectrum notified stakeholder of survey. Spectrum noted further contact to also be via [redacted]. Via phone call 01/08/18: FLO called stakeholder and informed of their appointment to consult with SSJF licence holders and that information had been posted to him. This stakeholder is considered relevant and Spectrum will continue to consult via [redacted] as part of the ongoing consultation process.
	01/02/19	3rd formal notification- 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them via [redacted] as part of the ongoing consultation process.
	14/03/19	Email outgoing	No repose has been received in response to the email outgoing sent to [redacted] on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation Action: Respond to [redacted] feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19 [redacted] expressed concerns via [redacted] on 21/08/18 regarding the seismic survey and its potential impacts to squid stock, Spectrum has provided the stakeholder with a summary of the literature on potential impacts and the management controls to minimise interference with fishing activity. Summary of potential impacts to squid: McCauley *et al.* (2002) and McCauley and Fewtrell (2012) found that squid displayed strong startle and alarm response when exposed to seismic noise. The sound modelling for the Otway Deep MSS using data from McCauley et al. (2002) suggests squid up to 4.3km away from the source may be affected. Although the range of the survey may overlap areas of squid fishing activity, the squid are expected to move away as the airgun approaches and so no effects on catch rate are expected before or after the survey. Spawning of Gould's squid occurs continuously throughout the year and at depths up to 700m and so impacts are unlikely. Management controls to minimise interference with finishing activities: Survey plans have been revised to when possible avoid overlap with key habitat along the continental slope.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Spectrum will notify relevant persons four weeks prior to the start of the survey detailing timing, location and duration. Fishers actively operating in the survey area will be issued a 7 to 10-day forecast prior to activities commencing in the survey area and will be kept informed of daily activities through Spectrum's 24-hour look-ahead communication process. Spectrum will advise relevant fishers of planned sail-lines and dates and if any issued are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflict. Long-term displacement of fishers is to be avoided by completing each cluster of surveys within a month. A support vessel will accompany the survey vessel and manage interactions. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process and will notify them at least four weeks prior to the survey commencing.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and their intermediaries and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	03/07/18 01/08/18	2nd formal notification 2A General Phone call outgoing (FLO)	Via phone call 01/08/18: Advised that all owners of [redacted] were very concerned about the survey and had engaged AFMA board member [redacted] to deal with this.	No objections or claims. Spectrum will respond to the submission by [redacted].	Via phone call 01/08/18: Spectrum called the stakeholder and informed of their appointment to consult with SSJF licence holders. This stakeholder is considered relevant and Spectrum will continue to consult with them via [redacted] as part of the ongoing consultation process.
Refer to [redacted] regarding consultation following 01/08/18	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them via [redacted] as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and their intermediaries and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Commonwealth Southern Squid Jig Fisher	11/06/18 31/07/18 01/08/18 01/08/18 01/02/19	1st formal notification 1A General 2nd formal notification 2C Fisheries Phone call outgoing (FLO) Email outgoing (FLO) 3rd formal notification 3A General	Via phone call 01/08/18: The stakeholder provided their contact email address. No feedback or response received in response to the email outgoing and 3rd formal notification sent to [redacted].	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	Via phone call 01/08/18: FLO informed the stakeholder of his appointment to deal with squid as FLO of Otway Deep MSS. The stakeholder provided email address and Survey information was then re-sent (01/08/18). This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher	30/07/18 01/08/18 01/02/19	2nd formal notification 2C Fisheries SMS outgoing (FLO) 3rd formal notification 3A General	No feedback or response received in response to the 2nd formal notification, SMS outgoing and 3rd formal notification sent to [redacted].	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	Via SMS 01/08/18: FLO sent an SMS to enquire about any impact on the stakeholders interests in the Commonwealth Squid Fishery from the proposed survey, and to send through their email details if they would like any more information. No response. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher	12/07/18 17/07/18	2nd formal notification 2C Fisheries Phone call outgoing	No feedback received in response to the second stakeholder consultation letter. Via phone call 17/07/18: The stakeholder raised concerns around the impacts to squid stocks. Will not be fishing the quota this year but intends to do so in 2019. They stated that they would get back to Spectrum with their concerns.	The stakeholder raised concerns about impacts to squid stocks [redacted] concerns regarding impacts to squid stocks are merited due to potential for survey to impact squid in 2019. Action: Spectrum to respond to [redacted] concerns	Via phone call 17/07/18: Spectrum called stakeholder to discuss the proposed survey and any concerns they may have. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to squid: The area within which the Otway Deep MSS survey area overlaps the squid jig fishery is <1%. Squid are also caught in the Commonwealth trawl sector fishery, which overlaps the survey area by 2%. Based on their study, McCauley et al. (2000)

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					suggested that a received level of 166 dB re 1 µPa SPL would give indications of the extent of disturbance (avoidance) to squid from seismic surveys. Interrogation of modelling results indicates that squid could therefore be affected between 1.7 and 4.3 km from the seismic source, which could overlap areas of low to med/high fishing effort/catch in a small area along the northern boundary of the survey area. No mortality or injury to squid is anticipated and disturbance in this area of the fishery would be limited to avoidance while the vessel traverses the survey lines in this area. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 15/03/19	3rd formal notification 3A General Email outgoing	No feedback received in response to 3rd formal notification and email outgoing send to [redacted].	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation Action: Spectrum to respond to [redacted] concerns (if any) in response to letter sent on 15/03/19 in on going consultation.	Via email outgoing 15/03/19: Spectrum responded to concerns raised by stakeholder in previous consultation. Concerns raised were concerning the impacts of the survey on squid stock. Spectrum's response provided a summary of the recent research, risk assessment of the potential impacts and proposed management. Guerra et al. (2004) suggested a link between physical damage to giant squid and nearby seismic surveys. McCauley et al. (2000) observed strong startle response by caged squid to nearby airgun start up. McCauley and Fewtrell (2012) noted squid displayed an increased frequency of alarm responses as airgun signal became most intense. Underwater sound modelling for Otway Deep indicated that squid up to 4.3 km from source may be affected. Range could overlap areas of squid fishing activity, but squid are expected to move away as airgun approaches meaning no effects on squid catch rate during and after the survey. McCauley and Fewtrell (2012) suggest a soft start decrease alarm response in squid. Therefore, soft starts will be employed during the seismic survey. Biomass of squid that may be subjected to seismic activity expected to be insignificant compared to biomass of broader stock. Survey area represents a minor portion of area actively fished by squid fishers. Therefore, no effects on catch from survey activity or vessel displacement is expected.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher	05/02/19 06/02/19 07/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing 1st formal notification 1D new AFMA fishers	No feedback or response received in response to the 1st formal notification, phone call outgoing and additional 1st formal notification sent to [redacted].	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	Via phone call 06/02/19: Spectrum called the stakeholder to discuss the proposed survey and attain an email address for information to be sent through to. No answer, left a message with contact details. Posted the consultation information to the address provided by AFMA (07/02/19). This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] VIC Rock Lobster FIsher	10/07/18 10/07/18 01/02/19	Phone call outgoing 2nd formal notification 2C Fishers 3rd formal notification 3A General	Via phone call 10/07/18: Provided Spectrum with email address for consultation package to be sent. No feedback or response received in response to the 2nd and 3rd formal notifications sent to [redacted].	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	Via phone call 10/07/18: Spectrum called the stakeholder to discuss the proposed survey and any concerns they may have, as well as to attain an email contact details to send through the information package. Via email outgoing on 10/07/18: Spectrum provided a follow up email to the previous phone call and supplied the 2nd formal notification 2C fishers package. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted]: CTH Southern And Eastern Scalefish And Shark Fisher Gillnet and Hook Sector Shark Gillnet and Shark Hook Sectors Scalefish Hook Sector Fisher	04/07/18 03/08/18 01/02/19	2nd formal notification 2C Fisheries Phone call outgoing 3rd formal notification 3A General	No feedback or response received in response to the 2nd formal notification, phone call outgoing and 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 03/08/18: Spectrum attempted to call the stakeholder to discuss the proposed survey and any feedback they may have. No answer, message left with contact details. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	11/06/18 01/08/18 03/08/18 03/08/18 03/08/18 03/08/18 03/08/18	2nd formal notification 2A General Phone Call Outgoing (FLO) Email outgoing Email outgoing Email outgoing Email incoming Email outgoing	No feedback received in response to the first stakeholder consultation letter posted. Via phone call outgoing 01/08/17: The stakeholder said that they are currently working on a boat but that another contact could check their email. Via email incoming 03/08/18: Stakeholder emailed to confirm receipt of the stakeholder information.	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	Via phone call outgoing 01/08/17: FLO phoned to introduce the proposal and told the stakeholder that information on the survey had been posted to them. Via email outgoing 03/08/18: Spectrum re-sent the consultation package and questionnaire template to the stakeholder. Via email outgoing 03/08/18: Spectrum re-sent the stakeholder package again as the information had not attached to the email correctly. Via email outgoing 03/08/18: Spectrum noted that the contents of the stakeholder package was not sending through correctly and offered to drop a copy directly to the stakeholder at the dock. Via email outgoing 03/08/18: After the stakeholder's confirmation of receipt, Spectrum emailed to confirm that all attachments could be opened correctly.
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted]	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	03/07/18 12/07/18 17/07/18 19/07/18 06/08/18	2nd formal notification 2A General 2nd formal notification 2C Fisheries Phone call outgoing Email incoming Email outgoing	No feedback received in response to the 1st and 2nd formal notifications sent to [redacted]. Via phone call 17/07/18: The stakeholder raised concerns over the impacts of being locked out of the fishing area during a busy and productive time of year. Stated that a vast area must be covered to catch key shark species. Via email 19/07/18: The stakeholder emailed stating they were interested in the survey and were concerned about the displacement of fishing during a busy time of year. They noted they were a holder of rock lobster, gillnet and squid entitlements and quota and they fish the area from Port MacDonald to King Island for gummy shark.	[redacted] expressed concern about being displaced from fishing grounds. [redacted] concerns regarding displacement from fishing grounds is merited due to vast area covered by stakeholder during fishing activity. Action: Spectrum to respond and provide information on displacement will be managed.	Via phone call 17/07/18: Spectrum called the stakeholder to discuss the proposed survey and any concerns they may have. Via email 06/08/18: Spectrum responded to [redacted] with information on displacement, with maps and explanation of how it will be managed. They also provided information on the movements of the vessel during the survey. No further feedback or response received. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to squid: The area within which the Otway Deep MSS survey area overlaps the squid jig fishery is <1%. Squid are also caught in the Commonwealth trawl sector fishery, which overlaps the survey area by 2%. Based on their study, McCauley et al. (2000) suggested that a received level of 166 dB re 1 µPa SPL would give indications of the extent of disturbance (avoidance) to squid from seismic surveys. Interrogation of modelling results indicates that squid could therefore be affected between 1.7 and 4.3 km from the seismic source, which could overlap areas of low to med/high fishing effort/catch in a small area along the northern boundary of the survey area. No mortality or injury to squid is anticipated and disturbance in this area of the fishery would be limited to avoidance while the vessel traverses the survey lines in this area. Rock Lobster There is no spatial overlap between the lobster habitat and the area that will be ensonified at levels above those which have been shown to affect lobsters. Spawning generally occurs in waters shallower than where the survey will occur with larval dispersal occurring over a very large spatial area.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					As a result of the factors described above, the survey is extremely unlikely to have effects on lobsters, the catch or their recruitment into the fishery. Day et al. (2016a) assessed the impact of seismic sound on buried rock lobster. Exposure to the maximum measured SPL of 209 to 212 dB re 1µPa (Lpk-pk) did not result in mortality of any adult lobsters or a reduction in the quantity or quality of larvae. Sharks The sound modelling predicted potential a range of effects from mortality to recoverable injury up to 50 m from the source for fish without swim bladders (e.g. sharks) and up to 110 m for all other pelagic fish species.
	01/02/19 02/02/19 19/02/19 19/02/19	3rd formal notification 3A General Email incoming Email incoming Email outgoing	Via email 02/02/19: Fisher responded to timings update stating they work within the area and will be affected by the new timeframe. Via email 19/02/19: Shannon states the fishing areas are critical to their business and will continue to operate in the area whilst he survey is underway unless they are fairly compensated.	Fisher will be affected by the new timings and requests information regarding compensation for displacement from fishing grounds. Action: Spectrum to respond to request for information.	Via email 01/02/19: Spectrum notified stakeholder of updated survey timings. Via email 19/02/19: Spectrum thanks stakeholder for the feedback and informs them that the information is an update to the timing, but all other aspects are the same. Noted their previous feedback regarding displacement and stated that the stakeholder had been sent information regarding the management of displacement. Notes that their vessel will be back in the water at the time of the survey. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Commonwealth Southern Squid Jig Fisher	11/06/18 04/08/18 01/02/19 22/02/19 22/02/19 13/03/19	2nd formal notification 2A General Email outgoing 3rd formal notification 3A General Email outgoing Email incoming Email outgoing	No feedback or response received to 2nd formal notification. Via email 22/02/19: Stakeholder advised has sold their squid licence and are not actively fishing.	[redacted] confirmed they are not stakeholders in this matter.	Via email 04/08/18: Spectrum email the stakeholder consultation package which had previously been posted (11/06/18). Via email 22/02/19: Spectrum enquired as to whether the stakeholder is still operational and could be fishing within the Otway Basin. Via email 13/03/19: Spectrum emails to thank the stakeholder for confirming that they have sold their squid licence and will not be actively fishing in the Spectrum Otway Deep Survey area. This stakeholder is not considered relevant and Spectrum will not continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	11/06/18 01/02/19	2nd formal notification 2A General 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notification sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Trawl Sector	04/07/18 01/02/19	2nd formal notification 2C Fishers 3rd Formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notification sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]	05/02/19 13/02/19 13/02/19 18/02/19 18/02/19 06/03/19 06/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing Phone call outgoing Email outgoing	Via phone call outgoing 13/02/19: Stakeholder confirmed email address and requested for another consultation letter to be sent. Via phone call 06/03/19: Stakeholder communicated that they were unsure how the proposed survey would affect their operations and provided an email address for further consultation updates. Spectrum informed the stakeholder that the consultation period would be coming to an end by the end of the following week.	No feedback provided. Reasonable opportunity has been given for response. No action required.	Via phone call 13/02/19: Spectrum called the stakeholder to discuss the proposed survey and any concerns they may have. Via email outgoing 13/03/19: Spectrum reiterated the phone conversation and sent another copy of the consultation letter to the email address confirmed by the stakeholder. Via phone call 18/02/19: Spectrum attempted to contact the stakeholder, to discuss the proposed survey and any concerns they may have. No answer, message left with contact details. Via email outgoing 18/02/19:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Southern and Eastern Scalefish and Shark Fisher		Phone call outgoing Email outgoing			Spectrum sent an email containing the voice message of the previous missed call. The message communicated the reason for the call, contact details, and the commitment to attempt to recontact the stakeholder if nothing was heard back. Via phone call 06/03/19: Spectrum called the stakeholder again to discuss the proposed survey and any concerns they may have. Via email outgoing 06/03/19: Spectrum emailed detailing the contents of the phone call regarding the proposed survey. An updated cDL onsultation letter was also provided. Spectrum recommended a response by 15th of March otherwise the consultation would be considered closed out. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Tasmanian Giant Crab Fisher Commonwealth Squid Jig Fisher Shark Gillnet Sector Commonwealth Trawl Sector VIC Rock Lobster Fisher	29/03/18 07/04/18 07/04/18 07/04/18	Phone call outgoing (FLO) 1st formal notification 1A General Phone call outgoing (FLO) Phone call incoming	Via phone call 29/03/18: Licence holder acknowledged he had received some material from TSIC but hadn't read it as he had just come in from sea. Licence holder informed the FLO of Tasmanian crab interests held by various stakeholders. Via phone call 07/04/18: Licence holder advised they had consolidated numerous western Victorian crab quota entitlements and the [redacted] was the only active crab fishing vessel in the zone. Expressed concerns about the impact of the survey on his ability to access crab grounds due to entanglement and the impacts of noise on crabs affecting his catch. He explained his operation was constrained to a limited area due to adverse trawler interactions further north. Provided contact details for [redacted] at sea.	The licence holder expressed concerns about access to fishing grounds, entanglement, and the impacts of seismic sound on crabs affecting their catch. [redacted] Concerns regarding access to fishing grounds, entanglement, and the impacts of seismic sound on crabs affecting their catch are merited due to stakeholders limited operation area. Action: Spectrum to address licence holder's concerns regarding access to fishing grounds, entanglement, and the impacts of seismic sound on crabs affecting their catch.	Via phone call 29/03/18: Spectrum contacted licence holder to notify them of the FLO's appointment to the Spectrum Otway Deep MSS. FLO followed up and emailed licence holder a map and a copy of the first stakeholder consultation letter on 07/04/18. Via email 07/04/18: FLO sent high resolution maps of survey footprint overlying bathymetry and requested feedback to mitigate adverse interactions. Via phone call 07/04/18: Spectrum phoned the licence holder to further discuss their concerns. Regarding access to fishing grounds due to entanglement risks, the FLO acknowledged that this was a serious operational concern for Spectrum and control measures would be adopted to avoid this risk. Spectrum subsequently provided licence holder with a copy of the second stakeholder consultation letter (01/06/18) that included control measures to avoid entanglement and vessel collision risks. Regarding the impacts of seismic noise on giant crab catches, FLO responded that the one fisher that continued to operate over the big reef during Origin's Crowesfoot survey experienced no drop in catch, despite fears that have been promoted by some about the adverse effects of seismic surveys. The FLO also explained that the Tasmanian study on lobster showed statocyst damage to lobsters in the control area that was remote from the seismic source but close to a shipping lane and subject to periods of loud continuous low frequency noise.
	08/04/18 08/04/18 08/04/18 11/04/18	SMS incoming Emails outgoing (x2) (FLO) Email incoming (FLO) Phone call incoming (FLO)	Via SMSs 08/04/18: Whilst offshore [redacted] sent SMS and noted that the survey area covered his entire operational area and that it would be a catastrophe. Via email 08/04/18: [redacted] asked about the FLO's role in the consultation process (relationship to Spectrum) and informed the FLO he would be in Apollo Bay to unload Wed or Thurs and available on the phone most of that time. Via phone call 11/04/18: [redacted] requested more information on survey coordinates (lats and longs). He provided information on the location of the crab fishing grounds and his annual catch and noted he fishes for shark when waiting for the crab pots to fish. Expressed fear of losing revenue due to reduced stocks as well as losing the market which he had spent three years building with [redacted] asked if the survey could be suspended or trimmed to reduce impacts on his fishing activities.	The licence holder expressed significant concern about the location of the survey overlapping his operational area, and concern of losing revenue due to reduced stocks. [redacted] concerns regarding the location of the survey area overlapping his fishing grounds and fear of losing revenue due to reduced stocks are merited due to stakeholders limited operation area. Action: Spectrum to address [redacted] concerns regarding location of the survey via further consultation.	Via SMS 08/04/18: FLO thanked [redacted] for his feedback and replied that he would email him. Via emails 08/04/18: FLO sent request for a meeting with [redacted], clarified his role in the consultation process and stated he had passed the licence holder's feedback onto Spectrum. Via phone call 11/04/18: FLO replied to the [redacted] that he had requested lats and longs be added to the maps and confirmed a time for a conference call with Spectrum to discuss his concerns.
	12/04/18 12/04/18	Phone call incoming (FLO) Conference call	Via phone call 12/04/18: [redacted] asked for [redacted] to be included in the conference call, which Spectrum obliged. Consultation with [redacted] is covered above.	The licence holder expressed concerns about the location of the OBNs and impacts to planktonic larvae and objected to the survey occurring during the closed season for female giant crabs.	Via conference call 12/04/18 (Spectrum, FLO, [redacted] and [redacted]): Spectrum noted the importance of obtaining detailed information on fishers' activities and noted that data sharing requests had been made to all fishing operators identified by the FLO. Spectrum advised that they were undertaking ongoing consultation to minimise interference with fishing activities.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			Via conference call 12/04/18 (Spectrum, FLO, [redacted] – [redacted] and [redacted]): [redacted] expressed concerns about the location of the OBNs and requested that the OBNs were placed on non-trawled areas. They objected to the survey occurring during the closed season for female giant crabs and was concerned about impacts to planktonic larvae based on the CSIRO study. They also noted concerns regarding impacts to SESSF GHAT GS and SESSF GHAT SHS fisheries and recommended Spectrum consults gillnet and automatic longline fishers.	They also recommended Spectrum consult with gillnet and longline fishers.[redacted] concerns regarding the location of the OBNs, impacts to planktonic larvae and objections to the survey occurring during the closed season for female giant crabs are merited. Action: Spectrum to address [redacted] concerns and ensure the location and timing of the survey is reviewed as part of the impact assessment for giant crabs, to reduce impacts to ALARP. Spectrum have already consulted with gillnet and longline fishers (outcomes are included in this table). No further action required.	Spectrum confirmed that the OBNs would only be placed on non-trawled areas noting that efforts to seek details of fishing locations were ongoing. Explained that an acoustic release would be used to recover the OBNs with only the ballast remaining on the seafloor. Spectrum stated that the spawning periods for all key fisheries species, including giant crab were being considered in the EP impact assessment and stated this information would be provided to them. Spectrum have since reviewed the recent literature published on the effects of seismic on zooplankton and have addressed the implications of the findings the study by McCauley et al (2017), as well as the subsequent CSIRO study on the impacts of seismic on zooplankton (Richardson *et al.* 2017) in the EP.
	01/06/18 02/06/18 18/06/18 30/06/18	2nd formal notification 2C Fishers Phone call outgoing (FLO) Phone call incoming (FLO) Phone call incoming (FLO)	No written feedback received in response to the second stakeholder consultation letter. Via phone call 02/06/18: [redacted] said the area from which he takes most of his catch adjacent King Island is very steep and although fishing in 400 m depth, his float ropes are much longer and likely to extend across 800 m depth on low current days. [redacted] referred to the relatively short distance to the reef, cited would cause impact on crustaceans. Via phone call 18/06/18: [redacted] phoned FLO for an update. FLO was waiting for an update from Spectrum at the time. Via phone call 30/06/18: [redacted] expressed concern with the central section of the survey area potentially impacting on his fishing operation via entanglement risk and concerns regarding seismic on catchability directly and in future. He expressed interest in seeking enduring arrangements with Spectrum and any other Oil and Gas company that propose work near his fishing grounds.	The licence holder expressed concerns about access to fishing grounds, entanglement, and the impacts of seismic sound on crabs affecting their catch. These concerns have been addressed with this stakeholder and they have not raised new concerns (refer to the rows above). Action: Spectrum to continue consultation with [redacted] to address his concerns.	Via email 01/06/18: Spectrum provided the second stakeholder consultation letter that contained a summary of the impact assessment for fisheries, including impacts to the giant crab and finfish fisheries and the control measures adopted by Spectrum to reduce impacts. Via phone call 02/06/18: The FLO returned a missed call from the stakeholder. This stakeholder is considered relevant and will Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 14/02/19 14/02/19 14/02/19	3rd formal notification 3A General Phone call outgoing (FLO) Email outgoing (FLO) Email incoming	Via phone call outgoing 14/02/19: Stakeholder requested correspondence records and information regarding previous discussions. Via email incoming 14/02/19: [redacted] expresses opposition to the survey, based on a range of concerns: Risk of entanglement and interference, Adverse effects of seismic activity on crabs Loss of income and declining value of quota Expresses intention to continue fishing during the survey, and requests to know what Spectrum plans to do to mitigate their conflict.	Objections based on concerns about value of quota following damage to fish stock and risks of entanglement and interference. Action: Spectrum to continue consultation with [redacted] to address his concerns.	Via email outgoing 14/02/19: FLO provided correspondence records and information regarding previous discussions between [redacted] and Spectrum via email as requested by phone.
	14/03/19		No response has been received in response to the email outgoing sent to [redacted] 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to [redacted] feedback (once received) to the email sent 14/03/19 in ongoing consultation	Via email outgoing 14/03/19 Spectrum provided a follow up to conversations beginning 11/05/18 and a response to concerns raised in emails of 30/06/18 and phone calls on 03/08/18. The concerns raised included the potential damage to fishing gear and impacts to crab stock. Spectrum supplied information regarding the change to the survey area was communicated previously and addressed the specific concerns. Access to Fishing Grounds and Interference with Fishing Gear: commercial and recreational fishers wishing to access fishing grounds may be temporarily displaced by the survey vessel and its streamers. Overlap will primarily happen along the continental slope and shelf edge in waters of 150-1000m depth. Effective displacement will be reduced due to the Survey Area being divided into smaller Acquisition Areas. Consultation with crab fishers lead to the trimming of the south-eastern part of survey area to minimise displacement and interference with finishing gear. Potential Impacts to Giant Crab stocks:

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					The area of giant crab habitat within the survey area that may be exposed to sound levels above the sub-lethal level as described by Day et al. (2016) is 319 km^2. Adult giant crabs undertake seasonal movements and as a result females may move to depths of <260m during summer whereas males stay deeper reducing crab biomass exposed to seismic sound (Levings 2008). Conservative sound modelling results for the Otway Deep MSS predicts potential sub-lethal effects in giant crabs between 175 and 260 m from the seismic source (Day et al. 2016). Infill or completing gaps in sail lines after initial seismic data acquisition will occur at a minimum >24 hours after first exposure. Spawning of giant crab occurs outside of the survey period and so the impact of the survey on reproduction is expected to be minor. Studies show minor impact on planktonic life stage due to dispersal by current (Richardson et al. 2017) Potential impacts to the Victorian Giant Crab Fishery from seismic sound: The amount of target habitat that may be exposed to sound levels above the 209 dB threshold for invertebrates comprises 16.6% of the total fishing area. Overlap between the ensonified and fished areas is not expected to impact the catch of giant crab fishers due to the expected negligible impact of seismic sound on individual giant crabs. The survey vessel will only be acquiring data in water depths of 400 m or less for a total of 8 days throughout the entire survey season (inclusive of line turns and part days rounded up). Potential impacts to the Victorian Giant Crab Fishery from physical displacement: The amount of potential fishing area within the Giant Crab Fishery that overlaps the survey operational area is 1,302 km^2 (68% of fishing area). Overlap between individual survey swaths and the fishery are much smaller than the overall overlap of the operational area. The Central Acquisition Area, where disruption is most likely, is oriented so they only overlap small areas of the continental slope (between 2.1-16.6% and average 6.9%). 16 day overlap between start of the open season Victorian Giant Crab Fishery and survey. Potential disruption to be minimised through advanced notification of the swath the survey vessel will be operating in. Impacts to commercial fisheries as a consequence of the physical presence of the survey vessel are expected to be minor. Proposed control measures to minimise potential impacts of seismic activities on fisheries: Spectrum will notify relevant persons four weeks prior to the start of the survey Fishers actively operating in the survey area will be issued a 7 to 10 day forecast prior to activities commencing in the survey area and will be kept informed of daily activity through Spectrum's 24-hour look-ahead communication process. Spectrum will continue to advise relevant fishers of planned sail lines and dates. Spectre will make reasonable effort to avoid or minimise conflict if issues are raised by fishing stakeholders. A support vessel will accompany the survey vessel and manage interactions with streamers and other vessels. Spectrum will pay compensation to the rightful owner of any fishing equipment damaged or lost as a consequence of survey activities.
	20/03/19	Email outgoing	No response has been received in response to the email outgoing sent to [redacted] on the 20th March 2019.	Action: Spectrum will respond to any feedback received in response to the email sent 20/03/19 in on going consultation	Via email outgoing 20/03/19: Spectrum responded to [redacted] concerns raised in his email outgoing, on the 14/02/19. Spectrum thanked [redacted] for providing his concerns regarding entanglement and interference with fishing activities, impacts on giant crab stocks, catch loss due to displacement, and future decline in catch rates due to mortality or displacement of crabs as a consequence of the MSS. Spectrum highlighted [redacted] additional request for information as to how Spectrum intend to mitigate this conflict between the survey and fishing activities. Assessment of potential impacts to giant crab stocks (ie assessment of mortality or displacement of crabs) You have previously received information regarding the assessment of impacts by the proposed MSS on giant crab adult and larvae. The area of giant crab habitat within the

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					survey area (i.e. <400 m depth) that may be exposed to sound levels above the sub-lethal level described by Day et al. (2016a), is 319 km2 (all within the Central Acquisition Area as there is no overlap with giant crab habitat/biological depth range by the West and South Acquisition Areas). However, adult giant crabs undertake seasonal movements in order to remain in sea water temperatures between 12 and 14˚C (Levings 2008). As a result, females in particular may move to depths of <260 m during summer whereas males may stay deeper (Levings 2008), thereby reducing the crab biomass exposed to seismic sound during the survey period. Giant crabs found in habitat adjacent SA and TAS state waters will not be impacted because survey activities will not occur in water depths less than 400 m. Sound modelling results for the Otway Deep MSS predicts potential for sub-lethal effects (no mortality) in giant crabs between 175 and 260 m from the seismic source based on the Day et al. (2016a) effect threshold (209 dB re 1µPa (peak to peak)) for lobsters and applied to giant crab as a proxy for crustacean species (recommended by the study authors). This is a conservative threshold based on previous species-specific studies that have investigated the effect of seismic on crab species and have not recorded mortality or stress bioindicators or avoidance behaviour. No evidence of mortality-associated population effects such as reduced abundance or catch rates were reported in snow crabs up to 12 days after exposure to received levels of 224 dB re 1 µPa (peak) (Christian et al. 2003). This same study also found no stress bioindicators in snow crabs (Christian et al. 2003; Christian et al. 2004). It is possible that infilling and/or repeat acquisition of lines may be required where gaps in the seismic data acquired are evident, e.g. due to shut-downs for cetacean mitigation. In the event of infill or completing gaps within sail lines, the time between initial seismic data acquisition along that line would be at a minimum >24 hours, and in reality, could be days to weeks, recovery would have occurred over this time. With spawning occurring outside of the survey period from May to August (Figure 1), and eggs held by females until release in shallower shelf waters of <260 m (i.e. inshore of the survey area) during spring (peaking during October, with low level hatching in November), the impacts of seismic sound on reproduction is expected to be minor. Minor impact is also expected on planktonic stages because of dispersal via currents will be significant, and a key factor in minimising any localised impact to plankton as a consequence of survey activities (e.g. Richardson et al. 2017). A field-based study investigating exposure of crabs to seismic sound revealed no differences in larval mortality or abundance for received levels of 230.9 dB re 1 µPa (peak) (Pearson et al. 1994). Based on the above assessment, impacts to giant crab life history stages as a consequence of the seismic survey are therefore expected to be minor. Assessment of potential impacts to giant crab fishers from seismic sound Operators within the Victorian giant crab fishery typically target depths between 150 to 300 m, although stakeholder feedback indicates fishing may occur to depths of 400 m. Within this depth range (conservatively to 400 m) fishers target a narrow band of habitat along the edge of the continental shelf (Figure 2). The amount of this target habitat that may be exposed to sound levels above the 209 dB threshold for invertebrates (ensonified area) comprises 16.6% of the total fishing area, between 150 – 400 m deep, within the Western Zone of the fishery. No overlap of the ensonified area with habitat in this depth range is found adjacent other state waters due to a revision of survey plans to avoid slope waters targeted by Tasmanian fishers. Catch and effort data provides the most suitable means of assessing potential impacts of seismic sound on giant crab, although this data is limited due to the small number of vessels operating in the fishery and confidentiality limits which preclude publication of data if there are less than five vessels involved. For example, catch data is not available for the Western Zone of the fishery during 2016/17 (the most recent year reported by the VFA; https://vfa.vic.gov.au/commercial-fishing/commercial-fish-production#fp-gc-year, accessed 6th March 2019). However in the previous year (2015/16) a total of 9 t of giant crab was caught throughout this zone and, based on percent overlap of fishing area within the survey area (16.6%), approximately 1.5 t of this total catch may have been taken within the survey area. Similarly, catch data for fisheries reporting blocks overlapping the 150 – 400 m depth range within the survey area could not be provided by the VFA for the most recent five years (2013/14 to 2017/18) because only one to four operators (average 2.4) reported catches from these blocks (even when data was pooled across the 17 blocks in question). However, data for the year 2012/13 – six years ago but the most recent year in which catch data is available for both the broader Western Zone and blocks within

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					the survey area – approximately 6.3 t (63%) of the overall catch of 10 t came from within the survey area. This significantly higher proportion of overall catch within the survey area may in part be due to the large size of the fisheries reporting blocks (~ 10 x 10 NM) relative to the narrow band of fishing habitat (Figure 2). Nevertheless, the overlap between ensonified and fished areas is not expected to impact the catch of giant crab fishers mainly because the impact of seismic sound on individual giant crabs is expected to be negligible (as indicated in the previous section), particularly considering that seasonal movement of individual giant crabs will result in a portion of the fishable stock being absent from the survey area over summer when the survey will occur. Furthermore, the survey vessel will only be acquiring data in water depths of 400 m or less for a total of eight days for the entire survey season (inclusive of line turns and with part days rounded to full days), including 2, 4, 1 and 1 days in Swaths 1 to 4, respectively (Swath 5 does not extend into waters less than 400 m). Given the maximum biological depth range of this species (<400 m), this is the maximum duration that fishable biomass would be exposed to sound levels that may cause sub-lethal effects. Sound avoidance behaviours could have a more longer term impact on populations, particularly if animals migrate out of an area in which seismic surveys are conducted. However, the study by Christian et al. (2003) found that snow crabs did not move to avoid low-frequency sounds. Avoidance, and therefore changes in catchability of giant crab by fishers is therefore not expected during the survey. Based on the above assessment, impacts to the giant crab fishery as a consequence of seismic sound during the survey are therefore expected to be minor. Assessment of potential impacts to giant crab fishers from displacement Displacement from fishing areas also has potential to cause considerable disruption to fishing activity. The operational area defines the area of potential displacement since it encompasses the overall area in which survey activities may impact the activities of fishers. The extent to which this occurs, however, will depend on the nature of the activities and in cases such as vessel transit or short-term fishing activities (ie lasting a few hours) there may be no disruption at all. This is further discussed below. In terms of industry-scale impacts, the number of active fishers is also an important consideration. The amount of potential fishing area within the Giant Crab Fishery (at depths between 150 to 400 m) that overlaps the operational area is 1,302 km2, which represents 68% of the overall fishing area in this fishery (Figure 2). Historic catches within the operational area also represent a large proportion of the total catch for the fishery, with approximately 7.5 t (83%) of the 9 t total for 2015/2016 (the most recent year in which data is publicly available). In addition, the fishing pots used in this fishery are typically left on the seabed for a minimum of 48 hours before retrieval (Levings 2008). This means the 2-3 fishers active in this fishery are more prone to displacement as a consequence of survey activities than are more mobile fishers such as trawler and line fishers. It also means that their fishing equipment is more prone to inadvertent loss or damage through survey activities if set in the area being actively surveyed. Nevertheless, the overlap between operational and fishing areas is expected to be less disruptive to giant crab fishers than indicated above. Firstly, spatial overlap between individual survey swaths and the area of the giant crab fishery are much smaller than the overall overlap with the operational area described above. These swaths are based on the pre-determined groups of survey sail-lines that will be followed by the survey vessel when acquiring survey data. Within the Central Acquisition Area where potential disruption is most likely, these swaths are orientated such that they overlap only a small area of the continental slope at their nearshore end before extending out to deeper waters. For Swaths 1 - 4 the area of overlap (including the turning circle of the seismic vessel) ranges from 43 to 319 km2, which represents between 2.1 and 16.6% of total fishing area (conservatively between 150 and 400 m depths) for the Victorian Giant Crab Fishery. No overlap at these depths in Swath 5. Swath 2 has the largest percent overlap, with the average for Swaths 1 – 4 being 6.9%. Secondly, the time period for completion of each swath varies from < 7 to < 40 days, with Swaths 2 and 3 taking the longest period (< 40 days). However, if seismic acquisition commences on the 1st October there will be a 47 day period before the start of the giant crab fishing season on the 16th November. This means that Swath 1 will be completed and there will be < 7 days left to complete the survey of Swath 2 by the time the fishery opens, with the remaining swaths (3-5) having no or minimal overlap with the area of the giant crab fishery (maximum of 43 km^2).

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					Potential disruption to fishing activities will also be minimised through advance notification of the swath in which the survey vessel will be acquiring data so that fishers may plan their activities to suit. This will also minimise potential loss or damage to fishing equipment, in particular pots deployed by giant crab fishers. Mitigation measures Based on the above assessment, impacts to commercial fisheries as a consequence of the proposed MSS are expected to be minor. Further, with adequate advance notification of activities by Spectrum, on-water communications between vessels, and the reasonable assumption that fishing gear including giant crab pots are satisfactorily marked so that they can be readily spotted at sea by the support vessel located ahead of the seismic vessel, it is unlikely that fishing equipment will be accidently damaged or lost as a consequence of survey activities. Nevertheless, Spectrum appreciates the impact that such an event may have on fishing activities and agrees to compensate the rightful owner of equipment lost or damaged as a consequence of survey activities, along with associated loss of catch for the fishing trip in which loss or damage occurred (provided that this has been adequately substantiated). It is also noted that potential disruption to fishing activities will also be minimised through advance notification of the swath in which the survey vessel will be acquiring data so that fishers may plan their activities to suit. It is also noted that compensation for loss of catch due to displacement is inherently difficult because it requires assessment of potential against realised catch, based on records demonstrating displacement had indeed occurred as a consequence of the MSS. Spectrum believes that it is not reasonable to claim this given the rationale described above, and as such does not believe such a compensation requirement is necessary.
	09/04/19	Email / Letter incoming	Via email incoming received 10 April 2019: Stakeholder expressed numerous concerns regarding financial viability of the fishery during and following the survey, displacement, and information provided in the EP: Stakeholder disputes Spectrums view that the survey area only overlaps 16.6% of the total fishery area as the survey area overlaps 100% of his usual fishing ground, agrees with Spectrum's statement that female giant crabs migrate to 260 m depths in summer however disagrees with the statement that this is a 'mass migration'. A significant portion of the female biomass and in particular, sub-legal size females remain in depths greater than 260m. Test trapping in depths from 250m to 400m during the summer months result in large catches of mixed gender giant crabs with sub-legal size females being very prevalent, including females laden with eggs in November and December. Hatching continues throughout December; therefore this migration offers little protection from seismic sound. Stakeholder says there has been no research of the effect of seismic sound on the lifecycle of the giant crab. Stakeholder is concerned that individuals will 'scatter' from the fishing area as there is no structure that provides cover on the substrate, resulting in a diminished catch per unit of effort. CPUE for the most recent season is 1.31kg/24hr pot lift. Stakeholder states that any displacement from his usual fishing area will cause disruption (100% of displacement) and financial loss, removal and relocation of this fishing equipment to make way for your vessel before this soak time is complete will result in failed shots and financial loss. Any losses incurred will have a direct negative impact on the market value of the stakeholders quota, stakeholder says that notice of activities and on-water communications will not mitigate financial loss, stakeholder thinks that it is unlikely the survey vessel will attempt to avoid his vessel or fishing gear, separation between his fishing activity and Spectrum's activity is unlikely due to the area's bathymetry, believes that the offset principle must be applied between Spectrum and SIV, need to make sure the fishery is left untouched following the survey. Stakeholder provided statements regarding the fishery and his operations: Stakeholder has worked in the Victorian crab fishing industry for 18 seasons, [redacted]	New objections / claims raised in [redacted] letter regarding overlap with his fishing area, females caught in his traps in 250-400 m water depth, duration of fishing equipment in-water. Spectrum has merit assessed all claims and objections raised in [redacted] letter below: Claim/objection: The survey overlaps 100% of his giant crab fishing ground. Note that this is different to Spectrum's view that the survey will overlap with 68% of the total fishing ground. Spectrum merit assessment: Spectrum has calculated the overlap of the Otway Deep Survey and Operational Area with the area of operation supplied by [redacted] via email on 13 May. The overlap of the Otway Deep survey and operational areas with [redacted] area of operations area 155.1 km^2 (7.5%) and 750.7 km^2 (36%), respectively. The EP has been updated with these new areas of overlap and that there will be no displacement of [redacted] operations due to the seismic vessel being outside of [redacted] area of operation by the time he starts his fishing season on 16 November. Claim/objection: "Commercial quantities of giant crab are only found in a small area of the zone" (coordinates and water depths provided). Spectrum merit assessment: Spectrum acknowledges the smaller area of operations by [redacted] and that the area of operation for commercial catches of giant crab is limited to the area [redacted] provided via email on 13 May. No change to the EP assessment. Claim/objection: the inshore migration of females in summer varies in times and numbers and a signification portion of stock remains in deeper water. Spectrum merit assessment: Spectrum has based information on movement of female crab	Via email outgoing: Spectrum requested a meeting with [redacted] and SIV in Melbourne to address the concerns in [redacted] letter dated 09/04/19. [redacted] and SIV agreed to a meeting in Melbourne on Monday 13/05/19.

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			[redacted]. Fishing season is 16th Nov- June, [redacted]. Stakeholder has fished the TAC for the last 5 years in the survey area and this data was provided to the FLO in July 2018 despite Spectrum's statement that they could not obtain the data, gear soak times are 2-10 days. Requests that Spectrum trim their area of operation to exclude the productive area of the crab fishery and this letter is included in the EP	on robust studies carried out on giant crab by Gardner (1998) and Levings (2008) as described in the EP, which states that the majority (and not all) of females migrate to shallower waters to spawn/hatch. No change required to the EP as the assessment does not assume that all females move to shallow water, and even if there is a 'significant portion' present in deeper waters up to 400 m, the EP assessment remains unchanged and there will be no effect of catchability. Claim/objection: Trapping in depths from 250 - 400 m during summer result in large catches of mixed gender giant crabs including females laden with eggs in November and December. Hatching continues throughout December, therefore this migration offers little protection from seismic sound. Spectrum merit assessment: Spectrum has based information on the hatching period of female giant crabs on scientific literature from Gardner (1998), Levings (2008) and the Victorian Fisheries Authority as described in the EP, which all state that hatching occurs in October (peak) and November (lower levels). The claim that females hatch in December is not backed by evidence; however even if hatching could occur in December there will be no change to the EP assessment as the seismic vessel will not operate in water depths <500 m from December (existing environmental performance standard (EPS)), and so would be spatially separated from any potentially hatching females. Claim/objection: the effects of exposure to seismic sound to hatching crabs, larvae, eggs etc. is unknown. Spectrum merit assessment: Spectrum has based the EP assessment on the most current scientific literature (refer to Section 6.1.4.1 and 6.1.4.2 of the EP), which have been provided to [redacted] in previous consultation (on 20 March). The overlap with giant crab biological depth range is small (<6 days, Section 6.1.4.2.4 of the EP) and the EP assessment has taken a precautionary approach in designing the survey to minimise the time spent in that depth range to that required to complete the survey objectives. No change to the EP assessment required. Claim/objection: Giant crabs will scatter as a result of seismic sound and this will result in a diminished catch per unit of effort. Spectrum merit assessment: Spectrum does not agree with this statement as this is contrary to literature evidence indicating that there will be no impact on catchability – as described in Section 6.1.4.2.4 of the EP. Spectrum consider that it is appropriate to apply the results of seismic studies on other species of crustacea, in particular we have taken a precautionary approach in the EP assessment in applying the results of Day et al. (2016) and their received sound level thresholds for southern rock lobster to the impact assessment for giant crab, which predicts that giant crab would only be affected	

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				within 300 m of the seismic source. Published studies referred to in the EP assessment support this being a precautionary approach, for example Day et al. (2016) found airgun exposure caused damaged statocysts in rock lobsters up to a year later. However, no such effects were detected in snow crabs after exposure to 200 shots at 10 s intervals and 17–31 Hz) (Christian et al. 2004). Claim/objection: Any displacement from fishing area will cause disruption to fishing activity and result in financial loss, including the potential for loss of market placement. Spectrum merit assessment: There will be no displacement of [redacted] from his area of fishing operations as the seismic vessel will not be operating in [redacted] fishing area during the time that [redacted] is actively fishing (i.e. 16 November to end June). No change to the EP. Claim/objection: Fishing equipment is deployed for duration of season with soak times typically 2 to 10 days. Spectrum merit assessment: There will be no displacement of [redacted] from his area of fishing operations as the seismic vessel will not be operating in [redacted] fishing area during the time that [redacted] is actively fishing (i.e. 16 November to end June). No change to the EP. Claim/objection: There is inadequate separation distance between the survey activity and his fishing activity while the survey vessel is operating in depths of 600m or less in his fishing area. Spectrum merit assessment: Spectrum does not agree with this statement as the seismic vessel will not be operating in [redacted] fishing area at the same time that [redacted] is fishing. In addition the seismic vessel will be more than 9 km from the boundary of [redacted] fishing area (at its closest point) by the time [redacted] commences fishing on 16 November. The seismic vessel will continue operating in an offshore direction and will therefore not be closer than 9 km to [redacted] fishing area. Spectrum can also confirm that there will be no infill survey activities after 16 November within [redacted] fishing area. Claim/objection: The area of operation must be trimmed to avoid the productive area of the Western Zone Victorian crab fishery. Spectrum merit assessment: Spectrum considers it is reasonable not to trim the survey lines which are necessary for tying in with historic datasets (which critical to meet survey objectives), because there is no scientific support for such an action conferring a benefit on the crab stocks and there will be no displacement effect on [redacted].	
	13/05/19	Meeting	Via meeting with SIV, stakeholder and Spectrum: Background to meeting: Stakeholders [redacted]), another giant crab stakeholder, fishes for giant crab on the Tasmanian side and together they account for nearly all of the Total Allowable Catch of giant crab in the southeast.	No new claims / objections. Spectrum has merit assessed [redacted] request to trim the Otway Deep survey area to exclude his fishing area as follows:	[redacted] is considered a relevant stakeholder and will continue to receive updates regarding the proposed Otway Deep MSS. A response to [redacted] claims and objections as set out in his letter (09/04/19), meeting minutes (13/05/19) and email (15/09/19) will be sent to [redacted] as part of the ongoing consultation process.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			[redacted] has raised many concerns with NOPSEMA about seismic impacts. SIV and stakeholder asked for an update on our EP and Spectrum provided an update and advised that the most recent version was on submitted To NOPSEMA for assessment on 9th April, with NOPSEMA response due 23rd May. Stakeholder asked for contact details of our lead assessor as he has been using the generic NOPSEMA email address. Contact details were provided during the meeting. Spectrum requested for stakeholder to clarify his area of operations and he agreed to provide this information. Spectrum explained that in our EP we have used biological information for our impact assessment which NOPSEMA has accepted as there is good research on the giant crabs' biological depth range/habitat. This is based on the most recent scientific literature as we are required to provide scientific arguments in our EP. Stakeholder also questioned why Spectrum did not respond to his most recent letter; Spectrum explained that this is why we are meeting today, to discuss stakeholder's concerns instead of simply writing an email. Stakeholder requested for a 2 nautical mile (~4km) buffer from his area of operations due to his concerns about physical interference. After understanding and realising that Spectrum won't be in his area of operations for long (we provided a map with sail lines and line turns and timing indications), the focus turned towards biological impacts. Stakeholder advised that the giant crab fishery south of Portland and Port Fairy where the Otway Deep survey overlaps does not produce commercially viable quantities. Stakeholder drew on a map where his most important area is in Victoria and he said that he would not allow any seismic to be carried out in this most productive zone and he would not grant Spectrum or anyone access to this area. Stakeholder advised that for the last 5 years he has caught the total TAC for the VIC giant crab fishery. Stakeholder advised he will provide Spectrum with coordinates of this area when he returns to his vessel (he operates out of Apollo Bay) and he will try to be as generous as he can. Stakeholder requested that he wants Spectrum to trim his fishing area from the survey area for the Otway Deep MSS. Spectrum also explained that Spectrum has a reprocessing project inshore of the survey area and hence Spectrum are acquiring seismic in order to tie into the historic dataset. Stakeholder requested for coordinates of the legacy 3D seismic surveys. Spectrum said that he would review stakeholders fishing area to see if it is possible to trim it from the Otway Deep survey area; however, the potential conflict with geophysical data requirements would need to be considered by Spectrum head office in Oslo, Norway. Stakeholder was concerned with the biological impact on giant crabs did not agree with the EP's impact assessment or the use of other crab species and invertebrates (e.g. rock lobsters) as a proxy when evaluating noise impacts as he says that he will only believe research that is specially carried out on giant crab. Spectrum questioned stakeholder that in the event that Spectrum cannot trim the survey area to avoid his fishing area completely, then would stakeholder welcome a scientific study to investigate the impacts on giant crab before and after the Otway Deep survey. Stakeholder said that he has no interest in Spectrum contributing funds for any research on giant crab. Stakeholder wants for there to be no seismic activities carried out in his area of operations year-round. Stakeholder said that Spectrums commitment to simply compensate for any lost pots makes a mockery of the time spent in deploying them; Spectrum representative explained that Spectrum has updated	Spectrum considers it is reasonable not to trim the survey lines which are necessary for tying in with historic datasets (which critical to meet survey objectives), because there is no scientific support for such an action conferring a benefit on the crab stocks. Further, there will be no displacement of [redacted] from his area of fishing operations as the seismic vessel will not be operating in [redacted] fishing area during the time that [redacted] is actively fishing (i.e. 16 November to end June). No change to the EP assessment outcomes. In addition, the seismic vessel will be more than 9 km from the boundary of [redacted] fishing area (at its closest point) by the time [redacted] commences fishing on 16 November, i.e. >2 nautical miles separation distance (requested by the [redacted]). The seismic vessel will continue operating in an offshore direction and will therefore not be closer than 9 km to [redacted] fishing area. Spectrum can also confirm that there will be no infill survey activities after 16 November within [redacted] fishing area. Action: Spectrum will respond to [redacted] email letter of 09/04/19 and concerns raised during the meeting on 13/05/19 in ongoing consultation.	

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			its commitment to include compensation for any catch lost as well as replacing any pots that Spectrum damage during the survey. Stakeholder and SIV asked about deployment/retrieval processes for OBNs and they did not raise any further questions or concerns.		
	15/05/19	Email incoming	Stakeholder supplied GPS coordinates and hand drawn map of latitude and longitudes of area of his giant crab fishing operations. He noted that the lobster fishing area is to the east of the ground and so is not a concern for the Otway Deep MSS.	No new claims / objections. Spectrum has merit assessed [redacted] request to trim the Otway Deep survey area to exclude his fishing area as follows: Spectrum considers it is reasonable not to trim the survey lines which are necessary for tying in with historic datasets (which critical to meet survey objectives), because there is no scientific support for such an action conferring a benefit on the crab stocks and there will be no displacement effect on [redacted]. Action: Spectrum will respond to [redacted] email letter of 09/04/19 and concerns raised during the meeting on 13/05/19 in ongoing consultation.	[redacted] is considered a relevant stakeholder and will continue to receive updates regarding the proposed Otway Deep MSS. A response to [redacted] claims and objections as set out in his letter (09/04/19), meeting minutes (13/05/19) and email (15/09/19) will be sent to [redacted] as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	05/02/19 18/02/19 18/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing	No response has been received in response to the 1st formal notification sent on 03/02/19 No response has been received in response to the phone call and email made on the 18/02/19	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call outgoing 18/02/19: Spectrum contacted the stakeholder to discuss the proposed survey. Nothing discernible could be heard. Spectrum followed up the phone call with an email documenting the reason for a call. This stakeholder is considered relevant and will continue to receive updates regarding the proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	05/02/19 13/02/19 13/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing	Via phone call outgoing 18/02/19 Spectrum spoke with the stakeholder who communicated he had yet to read through the consultation letter. As he regularly fishes in the Otway Basin he said he would read the letter and sent any concerns via email	Action: Spectrum will respond to any feedback received in response to the email sent 13/02/19 in on going consultation	Via email outgoing 18/02/19 Spectrum reiterated what was discussed with the stakeholder during the phone call and provided contact details for any further queries or concerns This stakeholder is considered relevant and will continue to receive updates regarding the proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	05/02/19 07/02/19 13/02/19 13/02/19 13/02/19 15/02/19 28/02/19	1st formal notification 1D new AFMA fishers Email incoming Phone call outgoing Phone call outgoing Email outgoing Email incoming 1st formal notification 1D new AFMA fishers	Via email incoming 07/02/19: Automated delivery failure email Via email incoming 15/02/19: Automated delivery failure email	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call outgoing 13/02/19: Spectrum attempted to call listed phone number but found a dead line Via phone call outgoing 13/02/19: Spectrum attempted to call the stakeholder again but encountered a dead line Via email 13/02/19: Spectrum emailed a follow up to the phone calls requesting updated contact information and providing a contact point. Via letter outgoing 28/02/19: Spectrum sent a copy of the 1st formal notification by post This stakeholder is considered relevant and will continue to receive updates regarding the proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	05/02/19 06/02/19 07/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing	Via phone call outgoing 06/02/19: Stakeholder asked to be called back later when [redacted] would be home and said they would look through the consultation package together	Action: Spectrum will respond to any feedback received in response to the 1st notification sent via post on 07/02/19 in on going consultation	Via letter outgoing 07/02/19: Spectrum sent a copy of the 1st formal notification to the stakeholder by post This stakeholder is considered relevant and will continue to receive updates regarding the proposed survey.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		1st formal notification 1D new AFMA fishers			
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery Commonwealth Trawl Sector	10/07/18 10/07/18 11/07/18 11/07/18 01/02/19	Phone call outgoing Phone call outgoing Phone call outgoing Phone call outgoing 3rd formal notification 3A General	Via phone call outgoing 11/07/18: [redacted] provided Spectrum with an email address for the consultation package to be sent to. Via phone call outgoing 11/07/18: [redacted] related that he was not interested in receiving additional information regarding the survey and was happy to be represented by SETFIA.	Action: Spectrum will respond to any feedback received in response to the 3rd notification sent on 01/02/19 in on going consultation	Via phone calls outgoing 10/07/19: Spectrum called [redacted] twice to discuss the MSS and acquire an email address to forward consultation material. No answer to each call but Spectrum left a message to return the call. The stakeholders are considered relevant and will Spectrum will continue to consult with them as part of the ongoing consultation process
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Trawl Quota Holder	05/02/19 06/02/19 11/02/19 11/02/19 21/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing Phone call outgoing Email incoming Email outgoing	Via phone call outgoing 06/02/19: Call reached representative law firm who said they would pass on the information to HR who would get in touch with the appropriate person. Via phone call outgoing 11/02/19: Law firm said they would follow up the inquiry and provide an email response by end of day. Via email incoming 11/02/19: Email confirms that stakeholder has been spoken to and has no objection to the proposed survey. No response has been received in response to the email outgoing sent to [redacted] on 21/02/19	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and will continue to receive updates regarding the proposed survey. Via email outgoing 21/02/19: Spectrum responded to the law firms response stating [redacted] had no objections to the proposed survey, with additional questions. Spectrum enquired as to whether [redacted] are actively fishing in the survey area and/or whether or not they require further consultation material and updates on the proposal (to determine if [redacted] is an affected party or a potentially interested party).
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	05/02/19 13/02/19 13/02/19 01/03/19 01/03/19 01/03/19 17/03/19 20/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing Phone call outgoing Email outgoing Email outgoing Email incoming Email outgoing	Via phone call outgoing 13/02/19: Stakeholder asked for the consultation letter to be resent to him and for Spectrum to call back to discuss once he had read it. Via phone call outgoing 13/02/19: Stakeholder confirmed he held multiple fisheries licenses having recently bought more. Stated he has not had a chance to read the consultation package and asked to be resent to read over the weekend. Stakeholder said he is planning to fish in the proposed region in the near future and will likely be affected. Via email incoming 17/03/19: Stakeholder responded after reading the consultation package. Stated main concerns were regarding boats fishing the Western Deepwater Fishery Licences. Acknowledged there would be an exclusion zone around the seismic vessel and requested strong and frequent communication in order to predict the operation of the vessel. Requested to be updated on survey.	Action: Spectrum will respond to any feedback received in response to the letter sent on 20/03/19 in on going consultation	Via email outgoing 13/02/19: Follow up to phone call made on 13/02/19 Via email outgoing 01/03/19 x 2: Spectrum followed up the phone call with an email documenting the conversation and provided the stakeholder with the consultation package for review. Via email outgoing 20/03/19: Spectrum responded to stakeholders concerns raised in the email incoming on 17/03/19 on the impact of the survey to catches of vessels fishing in the Western Deepwater Fishery. Assessment of seismic sound impacts on trawl fishery: Spectrum communicated that the stakeholder's fishery does not overlap with the proposed area for the survey. A review of research indicates fish may avoid areas of seismic activity which can result in a temporary reduction in catchability of commercially valuable fish. It is difficult to determine whether seismic activity has long term effect on fish catch due to other factors such as fishing pressure, climactic changes and natural variation in population dynamics. A number of studies in Australia and internationally have shown no clear or consistent relationships between seismic surveys and subsequent fisheries catch rates. Assessment of displacement impacts on the trawl fishery: Spectrum explained optional use of OBNs and provided a figure with their locations noting that two had changed location providing updated GPS coordinates. The survey will be acquiring data at depths of less than 1000 m for less than 15 days of the 120-day survey Fishers operating to these depths may still operate within the same swath as the seismic vessel as long as maritime law is maintained. Disruption to fishing activity will be minimised through advanced notification of the swath in which the survey vessel will be operating.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					This stakeholder is considered relevant and will continue to receive updates regarding the proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	05/02/19 12/02/19 06/03/19 06/03/19 06/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Phone call outgoing Phone call outgoing Email outgoing	Via phone call outgoing 12/02/19: Stakeholder stated he is fishing in the Otway Basin but would look at the consultation information further to determine whether he will be affected by the survey.	To date, no feedback has been received in regard to the consultation material that has been provided to the stakeholder. Sufficient time and information have been provided. No further action.	Via phone call outgoing 06/03/19: Called to landline, answered, incorrect number Via phone call outgoing 06/03/19: Called to mobile with no answer, Spectrum left a message documenting why the call was made and stating an email would be sent. Via email outgoing 06/03/19: Spectrum detailed the attempted calls and requested feedback on whether the stakeholder would be affected by the survey and consequently like to make a comment. Spectrum stated that they respect the stakeholder not wanting to make comment and will close out consultation if nothing was heard by 15/03/19. This stakeholder is considered relevant and will continue to receive updates regarding the proposed survey.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	07/02/19	1st formal notification 1D new AFMA fishers	No response has been received in response to the 1st formal notification sent to [redacted].	No feedback provided. Reasonable opportunity has been given for response. No action required.	Via letter outgoing 07/02/19: No contact number or email address was provided by AFMA and so the 3rd consultation package sent via post.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fishery	11/04/18 11/04/18 12/04/18 01/06/18	Phone call outgoing (FLO) Email outgoing (FLO) Meeting (FLO) 2nd formal notification 2C Fisheries	Via meeting with FLO at wharf on 12/04/18: Fisher expressed concern that that seismic was not good for fishing and scared marine fauna away such as whales and dolphins.	Fisher raised a general concern about the impacts of the survey on fishing and cetaceans. Concern merited as stakeholder is active in survey area. Spectrum to provided further information on the potential impacts of seismic surveys and the control measures that Spectrum has adopted in 2nd formal notification.	Via phone call and email 11/04/18: FLO made contact with fisher at Portland Trawl Wharf and followed up with phone call to get email contact details. FLO emailed high resolution maps and information about the proposed survey. Advised that Spectrum are assessing the impacts of the proposal and that their feedback would be greatly appreciated. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter – fisheries. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Fisheries Effects will be temporary as the seismic vessel traverses each survey line, and fish are expected to move away as the airgun array approaches. Localised effects on the catchability of commercially important finfish species within the survey area (pelagic or demersal) will be limited to a small radius on the seabed around the location of the airgun No feedback received.
	06/07/18 27/07/18	Meeting Email outgoing	Via meeting at wharf 06/07/18 (Spectrum, [redacted]): Fisher expressed concern about OBN placement between 100 m and 1000 m, stating that the only area they do not trawl is the canyons. Also concerned about areas where seismic becoming a dead zone for fishing after a seismic survey. Fundamentally opposed to seismic and interested in compensation.	Fisher stated he objected to seismic surveys and expressed concern about the location of the OBNs and the impacts of seismic sound on trawl species. The fisher also stated they were interested in compensation. Spectrum has already provided the fisher with information on the location of OBNs (in non-trawled areas), on the impacts of seismic sound on trawl species and on compensation. No further action.	Via meeting with Spectrum at wharf 06/07/18: Spectrum explained seismic activities to the stakeholder (that dynamite was not used) and offered to provide fisher with the proposed coordinates of OBN locations (locations were shown in the second stakeholder consultation letter) for feedback. The impacts of seismic sound were discussed and were summarised in the second stakeholder consultation letter already provided to the fisher on 01/06/18. Via email 27/07/18: Spectrum emailed to thank the fishermen for meeting and noted their concerns from 06/07/18. Explained the soft start process is used to drive away any fish in the area to mitigate the “dead zone” they raised. Confirmed dynamite and explosives are not used but compressed air. Attached the second stakeholder consultation letter for them again and a map of OBN locations and welcomed feedback on alternative OBN locations where they do not trawl. Compensation: The EP includes a control measure for compensation of fishers for equipment that is damaged beyond repair by the survey and this was also included in the second stakeholder consultation letter. Spectrum did ‘ALARP assess’ other compensation options and this assessment is in the EP. Compensation due to loss of catch or a fishery is not reasonable given the control measures adopted to minimise displacement of fishers, the inherent variability in abundance of commercial fish species, and reasonable expectation that fishers can utilise alternative fishing grounds in the short term.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	01/02/19	3rd formal notification 3A General	No feedback received in response to the 3rd formal notification sent to [redacted] on the 1st February 2019.	Sufficient time and information have been provided. No further action.	This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
	19/03/19	Email outgoing	No repose has been received in response to the email outgoing sent to [redacted] on the 19th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation. Action: Respond to [redacted] feedback (once received) to the email sent 19/03/19 in ongoing consultation	Via email 19/03/19 Spectrum responded to the stakeholder's queries regarding the new location of Ocean Bottom Nodes (OBNs) and a description and rationale for proposed compensation measures. OBNs: Spectrum response communicated to the stakeholder that OBNs are an optional component of the MSS and so the exact number to be deployed is yet to be determined. The response did indicate that the number will be no more than 20, of which no more than five will be in depths >1,000 m (four at >75 m and one at 60 m). The response included updated GPS coordinates for two nodes and figures of OBN locations, survey line swaths and the area of the Commonwealth Trawl Fishery. Compensation: Spectrum acknowledged that interference with fishing gear and displacement were key concerns raised during consultation with stakeholders. Due to controls including advertisement of OBNs well in advance and consultation with stakeholders, the loss or damage to equipment is considered unlikely. However, Spectrum's response communicated the commitment to compensate the rightful owner of any equipment lost or damaged as a result of the survey, along with associated loss of catch. Displacement: Spectrum's response also provides a summary of the potential disruption to fishing activities as a result of the survey. The response highlights that the survey will be acquiring data at depths of less than 1000 m for less than 15 of the 120 days of the survey. Disruption is to be minimised by advanced notification of where the survey will be operating. The stakeholders are considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher Gillnet, Hook and Trap Sector	04/07/18 03/08/18 03/08/18 03/08/18 01/02/19	2nd formal notification 2C Fisheries Phone call outgoing Phone call incoming Email outgoing 3rd formal notification 3A General	No feedback received in response to the first stakeholder consultation letter. Via phone call outgoing 03/08/18: Spectrum phoned fisherman, no answer. Via phone call incoming 03/08/18: Fisher advised that the deepest fished area is slightly less than the shallowest part of the survey. Requested another copy of the consultation letter. No response has been received in response to the 3rd formal notification sent to [redacted] on the 1st February 2019.	No feedback provided. Reasonable opportunity has been given for response. No action required.	Via email 03/08/18: Spectrum resent the first stakeholder consultation letter to him. No feedback has been received. This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Tas Giant Crab Fisher	11/06/18 28/02/19	2nd formal notification 2A General 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notifications sent to [redacted].	To date, no feedback has been received. Sufficient time and information have been provided. No further action.	This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
[redacted] Shark Gillnet and Shark Hook Sector Fisher	04/07/18 08/07/18 10/07/18 01/02/19	2nd formal notification 2C Fisheries Email Incoming Phone call outgoing 3rd formal notification 3A General	Via email 08/07/18: In response to the first stakeholder consultation letter fisherman emailed Spectrum stating he was interested in knowing more and requested that someone contact him to discuss the proposal. No response has been received in response to the 3rd formal notification sent to [redacted] on the 1st February 2019.	FV has requested to be contacted regarding the survey. Request merited due to potential for stakeholder to be impacted by survey. Spectrum will continue to keep [redacted] updated on the proposed Otway Deep MSS.	Via phone call 10/07/18: Spectrum phoned the stakeholder who advised that they fish around depths of 130 m and barely beyond 180 m as it is detrimental to the fishing gear used. He requested to be keep informed. This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Southern and Eastern Scalefish and Shark Fisher	12/04/18 12/04/18 13/04/18 13/04/18 13/04/18	1st formal notification 1A General Email outgoing (FLO) Email outgoing (FLO) Phone call incoming (FLO) Meeting (FLO)	Via emails outgoing 12/04/18: The FLO emailed high resolution maps and the first stakeholder consultation letter and encouraged feedback on the proposal. Via phone call incoming 13/04/18: In response to emails sent by FLO on 12/04/18 and 13/04/18, fisher phoned to enquire about the survey and stated he had heard of it through another fishman. Arranged to meet with the FLO in person the same day. Via meeting with FLO at wharf on 13/04/18: FLO met fisherman at wharf and provided hard copies of the materials that were emailed for them to review. Fisherman noted that based on experience seismic scared the fish away from the area for 3 or 4 months. FLO asked for feedback on the locations of the OBNs in relation to trawled areas.	Fisher claims that fish avoided area for 3-4 months after seismic. Spectrum to provide the fisher with a summary of noise impact assessment on trawled fish species in the 2nd formal notification sent on the 1st June 2018.	Via email outgoing 13/04/18: FLO sent the fisherman a map with proposed locations of OBNs and invited comment on their location in proximity to trawl operations. FLO also provided information on the OBNs, informing that after about a month the node part is recovered by triggering an acoustic release, which then leaves the two cylindrical concrete ballast weights on the bottom. Ballasts have a size of 150mm diameter, 630mm long Typically the ballasts sink into the top sediment layers The concrete ballasts degrade over a 10 year period, but are currently working on a special concrete mix which would give it a 3 – 18 month service life The FLO requested that the fisher please think about these specifications when deciding on safe possible locations. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter – fisheries. This letter contained a summary of the impact assessment for fish, including the control measures that Spectrum had adopted. No feedback was received.
	01/06/18 06/07/18 27/07/18	2nd formal notification 2C Fisheries Meeting Email outgoing	No feedback was received in response to the second stakeholder consultation letter sent on 01/06/18. Via meeting with Spectrum at wharf 06/07/18: Fisher had minor concern over 3 or 4 of the OBNs within the water depths trawling operations will occur. He requested the coordinates of the OBN placement to load into his plotter and would notify Spectrum if there are any issues. Stated that he doesn't envisage any issues arising and has requested to be kept informed.	Fisherman requested coordinates of the OBNs. Stakeholders request is merited due OBN locations occurring where they trawl. Spectrum provided [redacted] with the OBN coordinates in the email outgoing and 3rd formal notification.	Via email 27/07/18: Spectrum emailed [redacted] and stated they understand that [redacted] has no concerns about the seismic survey but does have concerns about the three or four OBNs between 100 m to 1000 m within his trawl grounds. Spectrum provided coordinates in excel and shapefile format and asked if he could import them to GIS plotter and recommend alternative locations it would be helpful, so Spectrum can place them where they will not pose issues for the trawling industry. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Fisheries Effects will be temporary as the seismic vessel traverses each survey line, and fish are expected to move away as the airgun array approaches. Localised effects on the catchability of commercially important finfish species within the survey area (pelagic or demersal) will be limited to a small radius on the seabed around the location of the airgun No reply received.
	01/02/19 18/03/19	3rd formal notification 3A General Email outgoing	No response has been received in response to the 3rd formal notification and email outgoing sent to [redacted] on the 1st February and 18th March 2019.	Sufficient time has been given for the fisher to respond to the consultation package provided	Via email outgoing 18/03/19: In response to [redacted] concerns over 3 or 4 of the OBN's within the water depths he fishes, Spectrum provided the 3rd formal notification which included an update to timing and the OBN coordinates for [redacted] to enter into his plotter to determine if there is any foul ground where the OBN's overlap the stakeholders trawl grounds. Spectrum also informed [redacted] that they had recently contacted [redacted] ([redacted]) and stated that [redacted] will continue to be updated on the proposed survey as well [redacted] This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher Gillnet Hook and Trap Sector	13/04/18 01/06/18	Meeting (FLO) 2nd formal notification 2C Fisheries	Via meeting with FLO at wharf on 13/04/18: Introductory meeting with FLO. [redacted] stated they plan to longline for ling. Requests information is sent to [redacted].	Fisherman requested information sent to [redacted] Spectrum to send information to [redacted]	Via meeting with FLO at wharf on 13/04/18: FLO provided high resolution spatial maps and a copy of the first stakeholder consultation letter to [redacted]. FLO got contact details for [redacted] to send him the information. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter – fisheries. No feedback was received.
	30/06/18	Meeting (FLO)	Via meeting with FLO at wharf on 30/06/18: Advised FLO of intention to longline for ling, blue eye trevalla and western bass in canyons where trawling cannot occur. Potentially detrimental impact caused by entanglement hazard with longlining gear. The gear contains float lines that pose an entanglement risk.	Fisher raised a concern regarding entanglement of longlining gear with seismic survey vessel. Spectrum has already provided the fisher with information on the control measures adopted by Spectrum to manage entanglement risks.	Via meeting with FLO at wharf on 30/06/18: FLO met with [redacted] to discuss their fishing activities in the area. The FLO acknowledged the fishers concern stating that entanglement was an important operational issue that had been noted and addressed by Spectrum. The second stakeholder consultation letter – fisheries, provided to the fishers for these vessels included the impact assessment for interaction with other users and control measures to avoid entanglement.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Spectrum will continue to advise relevant fishers of planned sail-lines and dates and if any issues are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflicts. Controls to be considered will include: Moving to another sail-line Deviating around fishing activity area by 3 km Allowing fishers to fish area prior to seismic acquisition Minimise survey activity in areas where there is known fishing activity. As part of the ongoing consultation process, Spectrum will notify all relevant persons four weeks prior to the start of the survey of the survey details including, timing, location, duration. Commercial fishers actively operating in the survey area and will be issued a 7 to 10 day forecast prior to activities commencing in the survey area. Commercial fishers actively operating in the survey area are kept informed of daily survey activities through Spectrum's 24-hour look-ahead communication. Payment of compensation to the rightful owner for any fishing equipment that has been damaged beyond repair by the survey and cannot be re-used.
	06/07/18	Meeting	Via meeting with Spectrum at wharf 06/07/18: [redacted] had only minor concerns and didn't envisage any problems with the activity. They advised Spectrum that gear is not left out all the time and have requested to be notified 48 hours before the survey is moving into water depths 400-700 m where drop lining and longlining methods are used.	Fisher requested notification of survey vessels movements in water depths 400-700 m. Action: Spectrum to review the suggestion to see if it is covered by the notification schedule for the survey.	Via meeting with Spectrum at wharf 06/07/18: Spectrum met with [redacted] to discuss their concerns further. Spectrum's notification schedule involves notifications to fishers four weeks prior to the start of the survey, a 7-10 day look ahead, and 24-hour daily look ahead. This will enable them to plan their fishing operations around the seismic survey. These fishers are considered relevant stakeholders and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No feedback received in response to the 3rd formal notification sent to [redacted].	No feedback provided. Sufficient time and information have been provided. No further action.	No objections or claims. Sufficient time and information have been provided. No further action.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher Gillnet Hook and Trap Sector	19/07/18 20/07/18 03/08/18 03/08/18 01/02/19 07/03/19 07/03/19 08/03/19	Phone call outgoing Phone call outgoing Phone call outgoing 2nd formal notification 2C Fisheries 3rd formal notification 3A General Phone call outgoing Phone call incoming Email outgoing	Via phone calls 19/07/18, 20/07/18 and 03/08/18: Spectrum attempted to contact [redacted] to discuss the proposal and obtain further contact details. Spoke with [redacted] on 03/08/18 who said he was interested in seeing the consultation letter but that his boat was out of the water. Stated he fished for gummy shark and school shark near King Island. He provided his email address. Via email 03/08/18: Spectrum forwarded the second stakeholder consultation letter to him. No feedback has been received. No answer to phone call outgoing 07/03/19 Via phone call 07/03/19: [redacted] returned call to discuss stakeholder update. He stated that he had seen the Update, but not paid it much attention as his boat had been involved in a significant accident. Stated that he would not be affected by the survey, but he may be in the next couple of years and would then potentially be affected. He asked that updates be sent but the no further consultation was required.	Fisher stated not a relevant stakeholder as will not be active at the time of survey but wishes to remain updated. Requested for further updates to be sent however does not require additional consultation on the proposed survey.	Via email 08/03/19: Spectrum documented phone call and noted fisher will not be affected during this survey, however requests to still be updated. This fisher is not considered a relevant stakeholder however will likely become relevant in the future once his vessel is fixed. Spectrum will continue to update them as part of the ongoing consultation process.
		Ongoing consultation: This fisher is not considered a relevant stakeholder but Spectrum will continue to update them as part of the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Small Pelagic Fisher	09/02/18 12/04/18 12/04/18 12/04/18 13/04/18	1st formal notification 1A General Phone call outgoing (FLO) Email incoming x2 (FLO) Email outgoing x2 (FLO) Email outgoing	Via email 12/04/18: Requested clarification of FLO role. Raised concerns about evidence of impacts of MSS on marine life. Requested Spectrum liaise with industry body SETFIA to understand impacts on the trawl sector.	Requested clarification of FLO role and to be contacted further via SETFIA. Spectrum provided additional information regarding impacts on Commonwealth Fisheries in the	Via phone 12/04/18: Follow up call regarding first notification. Via email 12/04/18: Provided clarification of FLO role and provided high resolution maps of the survey area. Via email 13/04/18: Provided advice that Spectrum had been liaising with SETFIA regarding mitigation of potential impacts.
	06/07/18 27/07/18	Meeting Email outgoing	Via meeting at wharf 06/07/18 (Spectrum, [redacted]):	Fishers stated they are objected to seismic surveys and expressed concern about the	Via meeting at wharf 06/07/18 (Spectrum, [redacted]):

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			Fishers expressed concern about OBN placement between 100 m and 1000 m, stating that the only area they do not trawl is the canyons. Also concerned about areas where seismic becoming a dead zone for fishing after a seismic survey. Fundamentally opposed to seismic and interested in compensation.	location of the OBNs and the impacts of seismic sound on trawl species. The fishers also stated they were interested in compensation. Spectrum has already provided the fishers with information on the location of OBNs (in non-trawled areas), on the impacts of seismic sound on trawl species and on compensation.	Spectrum explained seismic activities to the stakeholders (that dynamite was not used) and offered to provide them with the proposed coordinates of OBN locations (locations were shown in the second stakeholder consultation letter) for feedback. Via email 27/07/18: Spectrum emailed to thank the fishermen for meeting and noted their concerns from 06/07/18. Explained the soft start process is used to drive away any fish in the area to mitigate the "dead zone" they raised. Confirmed dynamite and explosives are not used but compressed air. Attached the second stakeholder consultation letter for them again and a map of OBN locations and welcomed feedback on alternative OBN locations where they do not trawl. The impacts of seismic sound were discussed and were summarised in the second stakeholder consultation letter already provided to the fishers on 27/06/18. The EP includes a control measure for compensation of fishers for equipment that is damaged beyond repair by the survey and this was also included in the second stakeholder consultation letter. Spectrum did 'ALARP assess' other compensation options and this assessment is in the EP. Compensation due to loss of catch or a fishery is not reasonable given the control measures adopted to minimise displacement of fishers, the inherent variability in abundance of commercial fish species, and reasonable expectation that fishers can utilise alternative fishing grounds in the short term.
	01/02/19 05/02/19 14/02/19 14/02/19 14/02/19 21/03/19	3rd formal notification 3A General 1st formal notification 1D new AFMA fishers Phone call outgoing. Email outgoing Email incoming Phone call outgoing	No feedback or response received in response to the 3rd formal notification. Via email incoming 14/02/19: Stakeholder explained they are away at the moment and will be back next week. Stated they are sure they will be affected and requested a call back when they are home. Via phone call outgoing 21/03/19: [redacted] stated he was aware of the survey and was checking the update to timing was the latest information provide regarding the project. [redacted] thanked Spectrum for the explanation of the update to survey timing. [redacted] stated he still holders concerns over displacement of fishermen as well as how the fishermen are going to be notified of the location of the survey vessel.	Fisher stated concerns over displacement of fishermen as well as how the notifications will work in notifying the fishermen of the location of the vessel. Spectrum responded to the concerns raised by the stakeholder via the email outgoing on 28th March 2019. The stakeholder will be given sufficient time to respond to the information provided and any response received by Spectrum will be addressed in ongoing consultation.	Via phone call outgoing and email outgoing 14/02/19: Spectrum contacted the licence holder of [redacted] to discuss the proposed survey with them. Spectrum noticed the similarity of the name in the email and [redacted] however as the AFMA data does not provide a contact name Spectrum treated the 3 licences as new fishers. Spectrum attempted to contact the licence holder however there was no answer and no possibility to leave a voice message. Spectrum followed up the phone call with an email stating the reason for their call and requested for the licence holder to get in contact with them. Via phone call outgoing 21/03/19: Spectrum phoned the stakeholder to discuss his email incoming on the 14th February 2019 where he had stated he will be affected by the proposed survey and would like to discuss the project further. Spectrum explained that the update provided explained the new updates to timing over the 3 year survey period. Spectrum stated they will provide a follow up email including information relating to Displacement and notifications regarding the proposed survey.
	29/03/19	Email outgoing			Via email outgoing 29/03/19: Spectrum responded to the stakeholder's concerns regarding potential displacement and the notification process: Assessment of displacement impacts to fishers: Displacement from fishing areas has potential to cause considerable disruption to fishing activity. The operational area defines the area of potential displacement since it encompasses the overall area in which survey activities may impact the activities of fishers (Figure 1). The extent to which this occurs, however, will depend on the nature of the activities and in cases such as vessel transit or short-term fishing activities (ie lasting a few hours) there may be no disruption at all. This is further discussed below. In terms of industry-scale impacts, the number of active fishers is also an important consideration. For each commercial fishery, the information used to assess potential displacement includes the depths fished by operators within the fishery, and the amount of this 'potential fishing area' within both the operational area and the overall jurisdiction of the fishery. For the five Commonwealth fisheries the area of potential fishing area within the operational area ranges from 481 km2 for the Squid Jig Fishery to 3,236 km2 for the Scalefish Hook Sector (SHS). Due to the broad depth range and large geographic extent of the SHS fishery, the amount of potential fishing area within the operational area is only 0.1% of the overall potential fishing area of this fishery. For other Commonwealth fisheries, the amount of overall potential fishing area within the operational area ranges from 0.2 to 5.5% of the overall fishing area for the respective fisheries. All of these Commonwealth fisheries operate year-round and catches are taken over a broad area. Available information (including from fishers) also indicates that operators in these fisheries are mobile and have broad fishing ranges. This includes the Commonwealth Trawl Sector (CTS), which has the largest proportion of

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					overall potential fishing area overlapping the operational area (5.5%). This percentage increases to 9.9% if the extent of potential fishing area is limited to the area west of Tasmania, based on information provided by a trawler fisher. The above information indicates that for most fisheries the amount of fishing area in which they may experience potential disruption to fishing activity due to an overlap in respective activities represents a minor proportion of the overall area in which they may fish. This is particularly the case when considering that spatial overlap between individual survey swaths and the area of each fishery is much smaller than the overall overlap with the operational area described above. These swaths are based on the pre-determined groups of survey sail-lines that will be followed by the survey vessel when acquiring survey data (Figure 2). Within the Central Acquisition Area where potential disruption is most likely, these swaths are orientated such that they overlap only a small area of the continental slope at their nearshore end before extending out to deeper waters. Considering other fisheries, the survey vessel will be acquiring data at depths of less than 1000 m (the maximum actively fished depth for trawlers) for less than 15 of the full 120 day survey duration (range of 1.4 to 5.1 days (average 2.8) within each swath). Fishers operating to these depths include Commonwealth trawlers and line fishers who may still operate within the same swath in which the seismic vessel is operating as long as maritime law is maintained. Furthermore, the survey vessel will be acquiring data in water depths of 400 m or less for a total of eight days across the whole survey season (including consideration of downtime). This equates to a total of 2 days in Swath 1, 4 days in Swath 2 and 1 day each in Swaths 3 and 4 (Swath 5 does not extend into waters less than 400 m). Stakeholder notification process: Potential disruption to fishing activities will also be minimised through advance notification of the swath in which the survey vessel will be acquiring data so that fishers may plan their activities to suit (refer to Section 9.5 for notification details). This will also minimise potential loss or damage to fishing equipment, in particular pots deployed by giant crab fishers. The following notification and on water interaction schedule will be maintained prior to and during the proposed seismic survey: Spectrum will notify all relevant persons four weeks prior to the start of the survey of the survey details including, timing, location and duration Fishers actively operating in the survey area will be issued a 7 to 10 day forecast prior to activities commencing in the survey area, and will be kept informed of daily survey activities through Spectrum's 24-hour look-ahead communication process Spectrum will continue to advise relevant fishers of planned sail-lines and dates and if any issues are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflicts. Controls to be considered will include: Moving to another sail-line Deviating around fishing activity area by 3 km Allowing fishers to fish area prior to seismic acquisition Minimise survey activity in areas where there is known fishing activity. A support vessel will accompany the survey vessel and manage interactions with other marine users' vessels transiting near the seismic vessel or streamers. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Tas and Vic Giant Crab Fisher Commonwealth Squid Jig Fisher Tas Rock Lobster Fisher	03/04/18 07/04/18 11/06/18	Phone call outgoing (FLO) Phone call outgoing (FLO) 2nd formal notification 2C Fishers	Via phone call 07/04/18: The relative of the stakeholder advised FLO that the [redacted] may fish the survey area but was at sea. Noted that the best way to provide the stakeholder information on the survey was via a posted letter.	No new objections, claims or feedback. Reasonable opportunity has been given for response.	Via phone call 03/04/18: FLO contacted fisherman to introduce himself and the proposal. Asked fisherman to call him back. Via phone call 07/04/18: FLO engaged a relative of the stakeholder over the phone to discuss the proposal. Via email 11/06/18: Spectrum posted 2nd formal notification 2C Fishers. No feedback was received.
	26/06/18	Meeting (FLO)	Via meeting with FLO 26/06/18: Stakeholder advised FLO they were not against petroleum exploration and has experience working as a support vessel but had concerns about the impact of the survey on the crab fishery. He recommended that the south easterly corner where the survey transects the shelf break be trimmed. Advised FLO that they work with 50 fathoms of	The stakeholder expressed concerns about the potential impacts of the survey on the giant crab fishery and risk of entanglement with gear. Spectrum has already provided the fisher with information on the management of noise impacts and entanglement risks (11/06/18).	Via meeting 26/06/18: FLO met with fisherman to discuss any concerns about the proposal. Spectrum considered the location and timing of the survey in relation to giant crab areas and following further consultation with crab fishers and has moved the south-eastern boundary of the survey area further offshore outside giant crab biological depth range.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			slack rope in addition to the depth the pots are set, raising the risk of entanglement.	The fisher proposed trimming the southwestern corner of the survey area to reduce impacts to giant crabs. Action: Spectrum to review the survey area and determine if it could be trimmed to reduce impacts to giant crabs.	In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Entanglement hazard Commercial fishers actively operating in the survey area and will be issued a 7 to 10 day forecast prior to activities commencing in the survey area Payment of compensation to the rightful owner for any fishing equipment that has been damaged beyond repair by the survey and cannot be re-used.
	28/07/18 31/07/18 02/08/18	Phone call outgoing (FLO) Email outgoing (FLO) Phone call outgoing (FLO)	Via phone call outgoing 02/08/18: In response to FLO's phone call the fisher was supportive of the change made to the survey area.	No objections or claims, the fisher provided positive feedback.	Via phone call outgoing 28/07/18: FLO called the fisher to let him know Spectrum had adopted his suggestion and trimmed the survey area and that he was waiting for a map to send through. Via email outgoing 31/07/18: FLO sent email with project information about the Tasmanian Giant Crab Fishery. Via phone call outgoing 02/08/18: FLO phoned the fisher to get his feedback on the change.
	01/02/19	3rd formal notification 3A General	No feedback received in response to the 3rd formal notification sent to [redacted] and [redacted].	No new objections, claims or feedback. Reasonable opportunity has been given for response.	This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]* Souther Squid Jig Fisher	04/07/18 17/07/18 01/02/19	2nd formal notification 2C Fisheries Phone call outgoing 3rd formal notification 3A	No feedback received in response to the first stakeholder consultation letter. Via phone call 17/07/18: Spectrum phoned [redacted] who was strongly opposed to seismic surveys. He stated he was not interested in responding to the email containing the consultation package that he was sent.	Stakeholder objected to seismic survey and stated they would not respond to the letter that was sent 04/07/18, despite Spectrum encouraging them to respond and elaborate on their opposition to seismic. No further action, however consultation will continue.	This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern and Eastern Scalefish and Shark Fisher	05/04/18 11/04/18 14/04/18 01/06/18 08/02/19	Phone call outgoing x 2 1st formal notification Email incoming 2nd formal notification 2C – Fishers 3rd formal notification 3A General	Via phone call outgoing 05/04/18: Stakeholder stated they fish to 85 fathoms, and that other vessels are not working as deep. Via email incoming 14/04/18: Stakeholder said the proposed survey area encroached on areas he fished in out to 85 fathoms south of Portland to south of Port Campbell however he believes the area Spectrum will be towing is outside that depth.	Stakeholder informed Spectrum they tow outside the depths of the survey area however may encroach on the operational area, however will not be towing in it. Spectrum provided the stakeholder with the 2nd and 3rd formal notifications including updates to timing and control measures regarding notifications to fishers to avoid displacement.	Via phone call outgoing 05/04/18: The FLO introduced himself and informed the stakeholder of the proposed survey. Stakeholder received 2nd and 3rd formal notifications subsequent to providing comment received 14/4/18. These provide stakeholder with information regarding assessment of impacts and associated control measures for fisher displacement, deployment of Ocean Bottom Nodes and effect of seismic sound on commercial species. Stakeholder will continue to be provided with updates to these measures.
[redacted] Southern and Eastern Scalefish and Shark Fisher Commonwealth Trawl Sector	10/04/18 10/04/18 11/04/18 12/04/18 12/04/18 01/06/18	Meeting (FLO) 1st formal notification 1A General Email outgoing Email incoming Email incoming 2nd formal notification 2C Fisheries	Via meeting with FLO at Portland Wharf on 10/04/18: FLO met with fisher to introduce himself and provided high resolution maps and introductory information on the proposal. Invited feedback on the survey. Fisher advised that the [redacted] fished from Beachport SA to NW Tasmania and targeted a range of fish in depths from 100 m to 1000 m. Via emails outgoing 10/04/18 and 11/04/18: The FLO followed up the meeting by sending the maps and first stakeholder consultation letter to the fisher by email. The first email bounced, but the second was received. Via emails 12/04/18: Fisher confirmed he received the information and provided coordinates for [redacted] recent operations. These indicated that the vessel had been trawling along the continental slope in the northwest part of the survey area at depths between 520 m and 580 m.	No objections or claims. The trawling coordinates provided helped Spectrum further understand the proximity of some Commonwealth trawl activities in relation to the survey location.	Via email 01/06/18: Spectrum sent the second stakeholder consultation letter – fisheries. No feedback was received. This fisher is considered a relevant stakeholder and Spectrum will continue to consult with them as part of the ongoing consultation process.
	05/07/18 27/07/18 01/08/18 08/08/18	Meeting Email outgoing Email outgoing Email outgoing	Via meeting 05/07/18: Stakeholder met Spectrum for a meeting and the following points were discussed	The stakeholder raised concern over the location of the OBN's that are to be deployed. Concern merited due to OBNs occurring in trawl areas. Stakeholder offered to provide advice on suitable locations could be to deploy the OBN's.	Via meeting 05/07/18: Spectrum met stakeholder for a meeting and the following points were discussed. Spectrum stated they would be interested in using the stakeholder's vessel as a chase vessel however cannot make any decisions at the moment but are happy to discuss as

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	10/08/18	Email outgoing	Concern regarding the 3 OBN units laying between 100-1000m as this is main trawling grounds. Willing to inform Spectrum of where the OBN's should be placed, if Spectrum are able to send through the coordinates of the OBN's proposed locations. Stated there are some canyons that the OBN's could be placed that would not affect trawling activities Stakeholder felt their foul ground would be representative of others Trawling occurs all year around. Requested if their vessel is able to be considered as a chase vessel.	Stakeholder felt their foul ground would be representative of others. Stakeholder requested for their vessel to be considered as a chase vessel. No objections or claims. Sufficient time and information have been provided. No further action.	the survey start date gets closer. Spectrum stated they will provide basic requirements and specifications needed for a chase vessel. Spectrum stated they would send through coordinates of the OBN's proposed locations. Via email outgoing 25/07/18: Spectrum emailed to provide maps of the proposed OBN locations for review and input by the [redacted]. Also attached the stakeholder consultation letter again and example specifications of a chase vessel. Also stated Spectrum would notify them four weeks prior to commencement of the survey and offered to provide bathymetric data when the survey is completed. Via emails outgoing 25/07/18 to 10/08/18: Spectrum sought [redacted] input on the proposed OBN locations and amended the locations in response to feedback from them and other fishers.
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted].	No objections claims or feedback. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher Gillnet Hook and Trap Sector Scalefish Hook Sector	11/06/18 01/02/19	2nd formal notification 2A General 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notifications sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern and Eastern Scalefish and Shark Fisher Gillnet Hook and Trap Sector Scalefish Hook Sector	11/06/18 01/02/19 08/03/19 08/03/19	2nd formal notification 2A General 3rd formal notification 3A General Phone call outgoing Phone call outgoing	No feedback or response received in response to the 2nd and 3rd formal notifications and phone calls outgoing to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 08/03/19: Spectrum attempted to contact stakeholder to discuss any concerns regarding the proposed survey and updates. No answer, left a message with contact details. Via phone call 08/03/19: Spectrum attempted to contact stakeholder on a second contact number to discuss any concerns regarding the proposed survey and updates. Still no answer, left a message with contact details. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Vic Rock Lobster Fisher	11/07/18	Phone call outgoing	Via phone call 11/07/18: Stakeholder notified Spectrum that they were aware of the proposed survey through [redacted] and that they don't need to know more. Informed that they would prefer to keep informed via [redacted].	Stakeholder requested to be notified through [redacted] of VRLA. Spectrum will consult with stakeholder via [redacted] of VRLA.	Via phone call 11/07/18: Spectrum made a phone call to the stakeholder to inform them of the proposed survey and gather an email address for a consultation package to be sent to. This stakeholder is considered relevant but in future Spectrum will continue to consult with them via [redacted] as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Cth Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Fisher Scalefish Hook Sector [redacted]	11/06/18 01/02/19	2nd formal notification 2C Fishers 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notifications sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	05/02/19 14/02/19 14/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing	No feedback or response received in response to the 3rd formal notification, phone call outgoing and email outgoing to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 14/02/19: Spectrum attempted to call stakeholder to discuss any concerns to do with the proposed survey and updates. No answer, left a message with contact details. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Commonwealth Southern Squid Jig Fisher	12/07/18 17/07/18	2nd formal notification 2C Fishers Phone call outgoing	No feedback received in response to the second stakeholder consultation letter. Via phone call 17/07/08: As members of SEMAC, they have voiced their concerns (squid, shark gillnetting and scallop) about the proposed survey to [redacted] from SETFIA.	Concerns have been raised via SETFIA. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted].	To date, no response has been received. Any concerns that may be raised by SETFIA on behalf of stakeholders will be addressed. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	11/06/18 25/06/18 27/06/18	2nd formal notification 2C Fishers Meeting (FLO) Meeting (FLO)	Via meeting 25/06/18: FLO met [redacted] in Tasmania. [redacted] was concerned about the impact of the survey on fisheries but was willing to help so that Spectrum and fishers could reach an acceptable agreement. Via meeting 27/06/18: FLO met [redacted] to discuss the proposal. [redacted] was concerned about the impact of the seismic survey on fisheries generally. He was not opposed to exploration but stated that it needs to be well clear of the crab grounds. [redacted] described the approximate areas that various fishers worked.	Stakeholder stated they are not opposed to Seismic however it must be well clear of the Crab grounds. In response, Spectrum provided the 2nd formal notification including control measures to minimise displacement of fishers as well as the impact assessment on giant crabs.	In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Fisheries: Effects will be temporary as the seismic vessel traverses each survey line, and fish are expected to move away as the airgun array approaches. Localised effects on the catchability of commercially important finfish species within the survey area (pelagic or demersal) will be limited to a small radius on the seabed around the location of the airgun Impacts to Giant Crab: Given, the giant crabs are found in <460m water depth, with spawning generally occurring within this depth range during winter (outside of the survey season), it is unlikely that there will be effects to giant crabs, or to the catch, or recruitment to the fishery. This is further supported by the most recent work on the effects of seismic on snow crab fishery catch rates, where no effect on catch rate was reported, and that if any effects these would be less than changes related to natural spatial and temporal variation (Morris et al. 2018).
	28/06/18 31/07/18 03/08/18	Phone call outgoing (FLO) Email Outgoing (FLO) Phone call outgoing (FLO)	Phone call with FLO 28/06/18: Advised FLO the multi-species fishery is restricted to TAS waters 3 NM off the coast, with some exceptions made under OCS arrangements for species such as striped trumpeter.	No new objections or claims. Reasonable time has been given for a response.	Via email 31/07/18: FLO emailed the second stakeholder consultation letter that contained information on giant crabs to [redacted]. Via phone call 03/08/18: FLO phoned [redacted] but no answer.
	06/08/18 06/08/18	Phone call incoming (FLO) Email incoming (FLO)	Via phone call incoming 06/08/18: [redacted] replied to FLO phone call and noted that the nearshelf corner of the proposed survey had been trimmed at the southern end. He expressed an ongoing fear of damage to the crab stocks that currently seemed to be recovering and referred to a survey about 10 years ago. FLO recommended [redacted] work with [redacted] to document their concerns in an email to Spectrum. Via email incoming 06/08/18: [redacted] emailed stating that if the survey proceeds and it impacts on their fishery (crab, crayfish and stripy trumpeter), they would require compensation for loss of our normal catch for the period until stocks return to pre-survey level. [redacted] referred to the changes since the 2010 seismic survey and that the fishery is only just returning to acceptable levels. They claimed that the Total Allowable Catch for crab was cut in half due to lower biomass following the survey and that they believed the survey impacted on the lower biomass.	[redacted] claims that the 2010 seismic survey cut the TAC of crab in half due to lower biomass because of the survey. Spectrum are not aware of evidence to support this claim therefore have not addressed this claim with [redacted], except to provide him with the impact assessment summary for Spectrum's proposed survey. No further action. [redacted] stated they would require compensation for loss of catch. Action: Spectrum to address [redacted] claim and his comments about compensation.	The impact assessment for the effects of seismic sound on crustaceans and finfish was summarised in the second stakeholder consultation letter provided to [redacted] on 11/06/18. The impact assessment considers the short- and long-term impacts of the seismic survey on fisheries. The letter also included a control measure for compensation of fishers for equipment that is damaged beyond repair by the survey. Spectrum did 'ALARP assess' other compensation options and this assessment is in the EP. Compensation due to loss of catch or a fishery is not reasonable given the control measures adopted to minimise displacement of fishers, the inherent variability in abundance of commercial fish species, and reasonable expectation that fishers can utilise alternative fishing grounds in the short term. Spectrum also considered the location and timing of the survey in relation to giant crab areas and following further consultation with crab fishers and has moved the south-eastern boundary of the survey area further offshore outside giant crab biological depth range. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. Assessment of merit of concerns for the Crab fishery and Finfish Fisheries are addressed above. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Rock Lobster There is no spatial overlap between the lobster habitat and the area that will be ensonified at levels above those which have been shown to affect lobsters. Spawning generally occurs in waters shallower than where the survey will occur with larval dispersal occurring over a very large spatial area. As a result of the factors described above, the survey is extremely unlikely to have effects on lobsters, the catch or their recruitment into the fishery.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Day et al. (2016a) assessed the impact of seismic sound on buried rock lobster. Exposure to the maximum measured SPL of 209 to 212 dB re 1µPa (Lpk-pk) did not result in mortality of any adult lobsters or a reduction in the quantity or quality of larvae. Compensation Commercial fishers actively operating in the survey area and will be issued a 7 to 10 day forecast prior to activities commencing in the survey area Payment of compensation to the rightful owner for any fishing equipment that has been damaged beyond repair by the survey and cannot be re-used.
	02/07/18 29/08/18	Phone call outgoing (FLO) Email outgoing	Via phone call outgoing 02/07/18: FLO phoned [redacted] who advised that he did not support seismic and did not want to provide contact details of crab fishers near King Island, which could put him in difficult position given TRLFA stance on no seismic. He requested biological information on giant crab for his own interest.	[redacted] objected to the seismic survey and requested biological information on the giant crab. Request for biological information is merited due to potential for survey to impact giant crab. Spectrum sent biological information on the giant crab to [redacted].	Via phone call outgoing 02/07/18: FLO assured [redacted] there was no desire for him to be in this sort of predicament, and that the information sent to him would assist him in having informed discussions. The FLO suggested that [redacted] talk through the issues with TSIC and TRLFA. Via email 29/08/18: Biological information on the giant crab was provided to [redacted]. No feedback on this information has been received. This stakeholder is considered relevant and will Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. Spectrum were advised by Representative of [redacted] (below via phone call on 19/02/19) that [redacted] is the key contact for all of [redacted] fishing licences.
	05/02/19 19/02/19 19/02/19 19/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing Phone call outgoing Email outgoing	Via phone call outgoing 19/02/19: Representative of the licences answered and stated that they were not aware of previously receiving any information regarding the proposed survey, and stated they didn't think the licence for [redacted] would be affected, however informed Spectrum it was best to speak with [redacted] who fishes under the licences. Licence holder representative requested to be sent an additional copy of the 3rd formal notification to be sent on to [redacted].	The representative of the 3 licences, [redacted] Requested for the stakeholder package to be resent. Spectrum sent consultation package to representative of the licences.	Via Phone call outgoing 19/02/19: Spectrum attempted to contact the representative of the 3 licences that had been purchased from AFMA with the same contact details (Spectrum noted the similarity in the surname of the licences and presumed a connection to previous consultation that had been undertaken with [redacted]). No answer to the phone call outgoing. Spectrum attempted to contact an alternative number on 19/02/19. Spectrum informed the representative of the licences that consultation had been ongoing with [redacted] since February of 2018. Spectrum stated they would follow up the phone call with an email including the stakeholder consultation package that had been sent on the 5th February 2019. Via email outgoing 19/02/19: Spectrum followed up the phone call with the representative of the 3 licences, documenting the phone call and including the consultation package that had been sent out on 5th February 2019.
	21/03/19 21/03/19	Phone call outgoing Email outgoing	Via phone call outgoing 21/03/19: Representative answered and stated that the licence of [redacted] is no longer operating and will not be affected by the proposed survey. Representative stated they were happy to continue to receive project updates in relation the propose Otway Deep MSS.	The representative of the 3 licences, [redacted] Requested to be kept updated with regards to the proposed Otway Deep MSS. Action: Spectrum to continue to send updates to the representative of the 3 licences.	Via phone call outgoing 21/03/19: Spectrum contacted the representative of the 3 [redacted] to discuss the proposed survey. Spectrum confirmed that [redacted] and [redacted] had been in consultation with Spectrum regarding the survey and that they would continue to receive updates regarding the survey. Spectrum asked the representative if they would like to continue to receive ongoing updates regarding the proposed survey. Via email outgoing 21/03/19: Spectrum followed up the phone call outgoing, with an email documenting the phone call. Spectrum noted that [redacted] is no longer operating and will not be affected by the proposed survey. Spectrum also noted that the main contact will be through [redacted]. Spectrum will continue to keep representative of [redacted] and [redacted] licences updated with regards to the proposed Otway Deep MSS. Spectrum considers [redacted] As relevant stakeholders and will continue to send updates regarding the Otway Deep MSS to the corresponding contact persons.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Commonwealth Southern Squid Jig Fisher **Refer also to [redacted] regarding consultation following 01/08/18**	30/07/18 01/08/18 01/08/18	2nd formal notification 2C Fishers Phone call outgoing (FLO) Email outgoing (FLO)	Via phone call 01/08/18: FLO phoned to discuss the proposal and [redacted] informed FLO that they are very interested in the project and that [redacted] will be responding to the project on their behalf.	Spectrum will respond to the submission by [redacted]. Action: Spectrum agreed via phone call to address [redacted] concerns raised in their phone call on 01/08/18 via [redacted].	Via email 01/08/18: FLO followed up the phone call by emailing the stakeholder the consultation package including the 2nd formal notification and questionnaire.
	01/02/19	3rd formal notification 3A General	No response received in response to the 3rd formal notification sent to [redacted].	No response has been received. Spectrum will respond to any concerns that may be raised through [redacted].	This stakeholder is considered relevant and Spectrum will continue to consult with them via [redacted] as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	11/06/18 01/08/18	2nd formal notification 2A General Phone call outgoing	Via phone call 01/08/18: Stakeholder informed that their vessels are trawlers off Southern NSW and East Gippsland, and that they are not intending to fish for squid there or in the Otway Basin. No feedback or response to the consultation package has been received.	To date, no feedback has been received in regards to consultation material distributed to the stakeholder. Sufficient time and information have been provided.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	05/02/19 13/02/19 28/02/19 19/03/19 19/03/19	1st formal notification 1D new AFMA fishers Email incoming Email outgoing Phone call outgoing Email outgoing	Via email 13/02/19: The stakeholder informs Spectrum which licenses they manage, and that as members of SETFIA they believe that [redacted] is handling the issue on behalf of them. Via phone call 19/03/19: The stakeholder agreed that they may have been confusing the surveys, and confirmed that as they stated via phone call (01/08/18) the previous year, they were still not planning to fish in the Otway Basin.	No new objections or claims. Reasonable time has been provided to the stakeholder.	Via email 28/02/19: Spectrum emailed to confirm that they are in consultation with SETFIA, and that they will send updates through them in the future. Via phone call 19/03/19: Spectrum called to confirm that when the stakeholder said that SETFIA would be handling the issue for they were not confusing this survey with a similar survey occurring in the Gippsland, and to confirm that as they had stated the previous year (phone call 01/08/18) they were still not planning to fish in the Otway Basin. Via email 19/03/19: Spectrum followed up the phone call with an email documenting the conversation where the stakeholder confirmed that they still do not fish in the Otway Basin. Spectrum informed that they would continue to keep them updated. This stakeholder is not considered relevant, but Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Cth Squid Jig Fisher	30/07/18 02/08/18 04/08/18	2nd formal notification 2C Fishers Phone call outgoing (FLO) Email outgoing (FLO)	Via phone 02/08/18: Advised FLO they would return the questionnaire to Spectrum. No feedback or response received.	Stakeholder claims that no one listens to fishermen. Spectrum acknowledged the stakeholders concerns that they are not listened to and responded via email.	Via email 04/08/18: FLO emailed copies of the second stakeholder consultation letter along with a questionnaire and map of the proposal.
	01/02/19 08/03/19	3rd formal notification 3A General Phone call outgoing	Via phone call 08/03/19: The stakeholder stated that they are represented by Seafood Industry Victoria. However, stated that they feel that no one listens to them and that squid will be affected by the survey. State that they fish from Portland to Queens-cliff and Lakes Entrance, and would like to be kept updated.		Via phone call 08/03/19: Spectrum acknowledged stakeholders concerns and their wish to be kept updated. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to squid: The area within which the Otway Deep MSS survey area overlaps the squid jig fishery is <1%. Squid are also caught in the Commonwealth trawl sector fishery, which overlaps the survey area by 2%. Based on their study, McCauley et al. (2000) suggested that a received level of 166 dB re 1 µPa SPL would give indications of the extent of disturbance (avoidance) to squid from seismic surveys. Interrogation of modelling results indicates that squid could therefore be affected between 1.7 and 4.3 km from the seismic source, which could overlap areas of low to med/high fishing effort/catch in a small area along the northern boundary of the survey area. No mortality or injury to squid is anticipated and disturbance in this area of the fishery would be limited to avoidance while the vessel traverses the survey lines in this area. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted], representing: [redacted]	01/08/18 01/08/18 03/08/18	Phone call outgoing (FLO) Email outgoing (FLO) Email outgoing (FLO)	Via phone call 01/08/18: FLO informed [redacted] of his appointment to consult with squid fishers as FLO of Otway Deep MSS. [redacted] provided email address so that survey information could be sent.	N/A.	Via email 01/08/18: FLO emailed the 2nd formal notification, map and stakeholder questionnaire to [redacted] Via email 03/08/18: FLO forwarded a cover letter from Spectrum for SSJF fishers.
	21/08/18 22/08/18 20/10/18	Email incoming Email outgoing Email outgoing	Via email incoming 21/08/18: [redacted] provided a response on behalf of [redacted] raising the following key concerns: fit out of additional fleet on hold due to concerns over potential seismic survey ([redacted]) lack of knowledge on the effect of seismic surveys on squid biomass and impacts to spawning concerns with the treatment of fishing stakeholders by oil and gas proponents concerns with the conclusions of the impact assessment that impacts are “unlikely” for all species except King George Whiting concern that the Survey Area overlaps part of the area fished by squid fishers and board trawl fishers, and a large area in which squid breed (you asked that the Survey Area be reduced to ensure there is no impact on the squid population or breeding areas) the evidence that exists demonstrating that seismic testing kills scallops and has adverse effects on southern rock lobster the lack of research on the potential impacts of seismic surveys on giant crab and their reproduction cycle given the impacts raised, the precautionary principle should be applied, and the oil and gas industry should either avoid the areas where these species live and breed or stop seismic testing until it is proven to do no harm.	[redacted] raised seven key concerns. fit out of additional fleet on hold due lack of knowledge on the effect of seismic surveys on squid biomass and impacts to spawning concerns with the treatment of fishing stakeholders by oil and gas proponents concerns with the conclusions of the impact assessment that impacts are “unlikely” for all species except King George Whiting concern that the Survey Area overlaps part of the area fished by squid fishers and board trawl fishers, and a large area in which squid breed the evidence that exists demonstrating that seismic testing kills scallops and has adverse effects on southern rock lobster the lack of research on the potential impacts of seismic surveys on giant crab and their reproduction cycle given the impacts raised, the precautionary principle should be applied, concerns are merited as [redacted] represents a number of license holders that may be impacted by the survey. Action: Spectrum to review and respond to each key concern.	Via email outgoing 22/08/18: Spectrum acknowledged receipt of the submission. Via email outgoing 20/10/18: Spectrum provided the following responses to the issues raised in [redacted] letter and via phone calls with [redacted]. Lack of knowledge: As you are aware (and as we have stated), the research on mortality or physical injury to squid from seismic sound is limited, however there is research available on the behavioural impacts (e.g. McCauley et al. 2000, Fewtrell and McCauley 2012) and this was used as the basis of the impact assessment. During the impact assessment, where there was uncertainty on the impact, or a lack of evidence, the precautionary principle was applied, and a conservative approach adopted. E.g. for squid, since no locations of concern (spawning aggregation areas) have been identified to date, Spectrum treated the entire area out to 825 m as potential squid habitat. Consultation: Spectrum stated that it was not in their interests to work against the fishing industry, and they have made best endeavours to provide considered, respectful and scientifically accurate responses to all stakeholder feedback, rather than insincere responses containing ‘spin’. Use of the term “unlikely”: This represents the outcome of considering the potential impacts in conjunction with the nature, scale, location and timing of proposed survey activities and the control measures adopted and represents the consensus of several professionals. Location of the survey area: Spectrum has used available catch and effort data to identify areas that overlap the survey area. The area of potential squid habitat that overlaps with the survey area (to a depth of 825 m) represents approximately 0.2% of the potential habitat for this species within the jurisdiction of the SSJF. The area within which the Otway Deep MSS Survey Area overlaps the squid jig fishery is <1%. Given the survey area overlaps a minor portion of the SSFJ, and that the timing of the survey is outside the period when peak catch and effort occur (based on the available data), with control measures in place, impacts to the population of Gould’s squid are likely to be minor (i.e. localised, short-term and have no overall effect on populations or ecosystem function). Seismic impacts on scallops and lobster: research to date has been considered, in conjunction with data analysis and modelling, the location and timing of the survey, and the control measures proposed, and Spectrum has determined that impacts to southern rock lobsters are unlikely and that wild stock scallops will not be impacted due to the shallow water depths in which they occur (mostly depths 10-20 m, and up to 60 m in the Bass Strait). These depths are much shallower than the minimum depth within the survey area (170 m). Impacts on giant crab: given the status of the Victorian and Tasmanian giant crab fishery’s, and the lack of available research, Spectrum has taken a precautionary approach to minimise impacts to these fisheries and are working with those fishers to mitigate those impacts (e.g. trimming part of the survey area). Precautionary principle: the impact assessment conducted has been completed in an objective manner, and the precautionary principle was applied where there was uncertainty and gaps in knowledge on the impacts to fished species. Spectrum considers that based on the impact assessment and the control measures adopted, the potential impacts have been reduced to ALARP and to an acceptable level.
	22/10/18 22/10/18 23/10/18 26/10/18	Email incoming Email outgoing Email incoming Email outgoing	Via emails 22/10/18: In response to spectrums responses, [redacted] stated they would prefer that any communication is made by email because information by phone can easily be misinterpreted. They did not receive the attachment for some reason, so it was resent and acknowledged by [redacted].	[redacted] noted they disagree with some of Spectrum’s responses. [redacted] claimed that research used to predict distances at which impacts to squid could occur is conjecture and not based on fact.	Via email 26/10/18: Spectrum acknowledged [redacted] concerns and agreed that there is uncertainty in the scientific literature and general community about the impacts of seismic activity on marine biota. Stated that the scale and type of impact depends very much on the specifics of each seismic, survey (type of gear, location, time of year etc) and that is why the modelling of

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
			[redacted] stated Spectrum had addressed all the concerns outlined in our response, even though they disagree with some of the comments, particularly relating to the "Precautionary Principle". [redacted] stated they have received replies from other companies planning seismic surveys detailing "scientific" research that shows may be affected within 1.4 km from the vessel in water depths of under 200m and 2.2 km from the vessel in waters 200-1000m" and believed it to be conjecture and has no basis of fact. Reiterated that until there is proven science that seismic testing does not harm squid, then the precautionary principle should be implemented, as per the legislation.	Action: Spectrum to provide further explanation via email as to how the predictions for the Otway Deep MSS were determined.	the spatial extent of underwater sound from seismic operations is critical. Noted that fortunately there is good understanding of the physics of sound in water. The models also require input of sound impact levels for biota though and given the uncertainty in this NOPSEMA are strict in ensuring the 'worst case' impacts are used in assessing impacts on the biota. No further response received. [redacted] and the licence holders that he represents are all considered relevant and Spectrum will continue to consult with them (via [redacted]) as part of the ongoing consultation process. The legislative issue of the precautionary principle has been detailed above. Spectrum cannot comment on the details of impacts from other surveys as it does not have all the information available to do so.In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to squid: The area within which the Otway Deep MSS survey area overlaps the squid jig fishery is <1%. Squid are also caught in the Commonwealth trawl sector fishery, which overlaps the survey area by 2%. Based on their study, McCauley et al. (2000) suggested that a received level of 166 dB re 1 µPa SPL would give indications of the extent of disturbance (avoidance) to squid from seismic surveys. Interrogation of modelling results indicates that squid could therefore be affected between 1.7 and 4.3 km from the seismic source, which could overlap areas of low to med/high fishing effort/catch in a small area along the northern boundary of the survey area. No mortality or injury to squid is anticipated and disturbance in this area of the fishery would be limited to avoidance while the vessel traverses the survey lines in this area.
	08/03/19	3rd formal notification 3A General	No feedback or response received.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	14/03/18	Email outgoing	No repose has been received in response to the email outgoing sent to [redacted] on the 14th March 2019.	No new objections, claims or feedback. Reasonable opportunity will be given for response. A response will be addressed in ongoing consultation	Via email outgoing 14/03/18 (to [redacted] and [redacted]): [redacted] expressed concerns via [redacted] on 21/08/18 regarding the seismic survey and its potential impacts to squid stock, Spectrum has provided the stakeholder with a summary of the literature on potential impacts and the management controls to minimise interference with fishing activity. Summary of potential impacts to squid: McCauley *et al.* (2002) and Fewtrell and McCauley (2012) found that squid displayed strong startle and alarm response when exposed to seismic noise. The sound modelling for the Otway Deep MSS using data from McCauley et al. (2002) suggests squid up to 4.3km away from the source may be affected. Although the range of the survey may overlap areas of squid fishing activity, the squid are expected to move away as the airgun approaches and so no effects on catch rate are expected before or after the survey. Spawning of Gould's squid occurs continuously throughout the year and at depths up to 700m and so impacts are unlikely. Management controls to minimise interference with finishing activities: Survey plans have been revised to when possible avoid overlap with key habitat along the continental slope. Spectrum will notify relevant persons four weeks prior to the start of the survey detailing timing, location and duration. Fishers actively operating in the survey area will be issued a 7 to 10-day forecast prior to activities commencing in the survey area and will be kept informed of daily activities through Spectrum's 24-hour look-ahead communication process. Spectrum will advise relevant fishers of planned sail-lines and dates and if any issued are raised by fishing stakeholders, Spectrum will make reasonable effort to avoid or minimise conflict. Long-term displacement of fishers is to be avoided by completing each cluster of surveys within a month. A support vessel will accompany the survey vessel and manage interactions. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process and will notify them at least four weeks prior to the survey commencing.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	04/07/18 01/02/19	2nd formal notification 2C Fishers 3rd formal notification 3A General	No feedback or response received.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern Squid Jig Fisher	04/07/18 17/07/18 01/02/19	2nd formal notification 2C Fishers Phone call outgoing 3rd formal notification 3A General	Via phone call outgoing 17/07/18: Stakeholder expressed opposition to seismic surveys but did not wish to elaborate. Stakeholder also stated he was not interested in responding to the email containing the consultation package.	Stakeholder has raised general objections opposing seismic surveys which are merited. Spectrum acknowledges these general concerns, noting that the stakeholder did not want to offer any specific objections. Spectrum provided a summary of the impact assessment and control measures in the 2nd formal notification, and updated information on the assessment of impacts in the 3rd formal notification.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. Via 3rd formal notification email outgoing 01/02/19: Seismic surveys are designed, planned and executed to prevent potential conflicts with other marine users. Spectrum has undertaken acoustic sound modelling for the MSS using an independent third-party specialist. This informs the survey design and determines control measures to minimise potential impacts to the marine ecosystem. The potential impacts from the survey on all fish and invertebrates, and on their commercial catchability, have been assessed as having negligible to minor impacts which are localised and short-term. Fish and invertebrates are expected to recover once the survey is completed. The potential impact on fish eggs/larvae have been found to be negligible when compared with the natural mortality rates for fish.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher Commonwealth Trawl Sector Fisher	05/02/19 12/02/19 12/02/19 06/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing Email outgoing	Via phone call outgoing: [redacted] stated that he regularly fishes in the Otway basin but has not had an opportunity to read through the stakeholder material sent to him on the 5th February 2019. [redacted] raised general disapproval for seismic surveys stating that the science is one sided and the surveys cause disruption to the ecology of the environment. [redacted] stated he would read the information package and respond with any concerns he had directly to Spectrum.	[redacted] has raised the following merited concerns: The science is one sided Surveys disrupt the ecology of the environment Spectrum has responded to [redacted] concerns and will continue to keep [redacted] updated on the survey as he is fishing in the activity EMBA	Spectrum appreciates your concern for the potential risks associated with the seismic survey. Spectrum have conducted an extensive risk and impact assessment for the proposed survey and will implement control measures provided in formal notification package.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Cth Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Fisher Scalefish Hook Sector	11/06/18 21/02/19 07/03/19 07/03/19	2nd formal notification 2A General 3rd formal notification 3A General Phone call outgoing Phone call outgoing	No feedback or response received in response to the 2nd and 3rd formal notification and phone calls outgoing to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 07/03/19: Spectrum attempted to call to discuss any concerns the stakeholder may have about the proposed survey and updates. No answer, left voicemail with contact details. Via phone call 07/03/19: Spectrum attempted to call again to discuss any concerns the stakeholder may have about the proposed survey and updates. No answer, left voicemail with contact details. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher	11/06/18 30/07/18 01/08/18 01/08/18	2nd formal notification 2A General 2nd formal notification 2C Fishers Phone call outgoing Email outgoing	Via phone call 01/08/18: FLO informed the stakeholder of his appointment to deal with squid as FLO of Otway Deep MSS and flagged that there was email about the survey for him. [redacted] provided their email address and the email was sent. No feedback or response received in response to the 2nd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via email 30/07/18: FLO sent the 2nd formal notification. Via phone call 01/08/18: FLO informed the stakeholder of their appointment to deal with squid as FLO of Otway Deep MSS FLO and flagged that there was email about the survey for him. [redacted] provided their email address. Via email 01/08/18: FLO sent the stakeholder the consultation package including the 2nd formal notification 2C Fishers and the questionnaire. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Commonwealth Southern Squid Jig Fisher	11/06/18 04/08/18	2nd formal notification 2A General Email outgoing	No feedback or response received in response to the 2nd formal notification and email outgoing send to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 07/03/19 08/03/19	3rd formal notification 3A General Phone call outgoing Email outgoing	Via phone call 07/03/19: Stakeholder informed that that they do not currently fish in the Otway Basin and would not likely be fishing there in the near future, however they would like to be kept updated as there is a small chance this may change.	Stakeholder requested to be kept up to date with the survey. The request is merited due to the potential for the stakeholder to be fishing in the Otway Basin in the future Stakeholder will be kept informed and up to date as requested.	Via email outgoing 08/03/19: Spectrum followed up the phone call with an email acknowledging that the stakeholder does not currently fish in the Otway Basin and would not likely be fishing there in the near future, however would like to be kept updated as there is a small chance this may change. Informed that they should receive these updates intermittently as the proposal progresses and as the survey gets underway. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Squid Jig Fisher	30/07/18 03/08/18 03/08/18	2nd formal notification 2C Fishers Email outgoing Phone call outgoing	No feedback or response received in response to the 2nd formal notification, email outgoing and phone call outgoing send to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 07/03/19	3rd formal notification 3A General Phone call outgoing	No feedback or response received in response to the 3rd formal notification and phone call outgoing to Louie and Marina Hatzimihalis.	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call outgoing 07/03/19: Spectrum called to follow up if there were any questions or concerns with the updates sent through. No answer and no voicemail possible This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Cth Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Fisher Scalefish Hook Sector	11/06/18	2nd formal notification 2A General	No feedback or response received in response to the 2nd formal notification sent to [redacted]	No response was received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 08/03/19 08/03/19	3rd formal notification 3A General Phone call outgoing Email outgoing	Via phone call outgoing: Stakeholder informed that they no longer fish and will not be affected by the survey. However, expressed general concerns about oil and gas exploration in regard to climate change, and stated that they believe we need to switch to renewables. Also stated that they do not feel that the opinions of fishers are taken into account when large businesses decide to do something. Expressed that they no longer wish to receive updates or communication from Spectrum.	Stakeholder stated they are no longer fishing however held concerns about oil and gas exploration in regard to climate change. The stakeholder also raised concern that the opinions of the fishers are not taken into account. These claims are not merited however Spectrum have responded to the stakeholder and ensured no further contact will be made.	Via email 08/03/19: Spectrum sent an email following up to the phone call with the stakeholder. Spectrum acknowledged the stakeholders concerns regarding consultation with fishers, stating that Spectrum is attempting to take into account a variety of stakeholder concerns, and that as a result have made alterations to the proposed survey area to avoid specific locations of concern including migratory routes and key fishing grounds of species that some stakeholders have stated they believe are particularly vulnerable, as well as a number of other changes to the proposal. Acknowledged that they no longer wished to receive updates or communication from Spectrum. This stakeholder is not considered relevant and at the stakeholders request Spectrum will no longer consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Trawl Quota Holder, Scalefish Hook Quota Holder	05/02/19 06/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing	No feedback or response received in response to the phone call outgoing and 1st formal notification sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 06/02/19: Spectrum attempted to call to discuss project and ascertain email address to send consultation information. No answer, left message. Information send via post instead (07/02/19). This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Squid Jig Fisher	30/07/18 04/08/18 01/02/19	2nd formal notification 2C Fishers Email outgoing 3rd formal notification 3A General	No feedback or response received in response to the phone call outgoing and 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Vic Rock Lobster Fisher	11/07/18 11/07/18 07/02/19	Phone call outgoing 2nd formal notification 2A General 3rd formal notification 3A General	Via phone call 11/07/18: Stakeholder provided Spectrum with a postal address that they want the stakeholder consultation package to be sent to.	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 11/07/18: Spectrum called stakeholder to inform them of the proposed survey and gather an email address for a consultation package to be sent to. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
[redacted]: Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Secor, Scalefish Hook Sector Fisher owner [redacted]	06/04/18 07/04/18 09/04/18 09/04/18 10/04/18	Phone call outgoing (FLO) 1st formal notification 1A General (FLO) Phone call incoming (FLO) Email incoming Email outgoing	Via phone call incoming 09/04/18: The owner phoned and advised FLO that the survey was unlikely to impact fishing activities. Via email 09/04/18: [redacted] target Ling between October and November on the central west coast of Tasmania. Noted that they had fished for blue eye grenadier off King Island in the past but currently has no plans to fish the area again. They requested access to any high-resolution imagery from the survey.	[redacted] requested high-res imagery from the survey, which is merited. Action: Spectrum to provide high-resolution bathymetry from the survey to [redacted] at the completion of the survey. This action has been loaded into Consultation Manager software for future follow-up.	Via phone call 06/04/18: FLO contacted the owner of [redacted] to introduce himself and the proposal. He said he would send some maps and other materials through and they could phone him back when they had time to digest the material. Via email 07/04/18: The FLO emailed high resolution maps and the first stakeholder consultation letter to the owner for his information and requested feedback on any potential impacts to [redacted] activities. Via email 10/04/18: Spectrum acknowledged [redacted] response and stated they would continue to keep them informed via notifications four weeks prior to each survey, which will include details on the location, timing and sail lines. Spectrum also acknowledged their request for high-res bathymetry from the survey and will provide it on completion of the survey.
	01/06/18 01/02/19	2nd formal notification 2C Fishers 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notification sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Cth Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Fisher Scalefish Hook Sector	11/06/18 04/07/18	2nd formal notification 2A General 2nd formal notification 2C Fishers	No feedback or response received in response to the 2nd formal notifications sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 07/03/19 08/03/19 08/03/19 08/03/19 10/03/19	3rd formal notification 3A General Phone call outgoing Email outgoing Phone call incoming Email outgoing Email incoming	Via phone call 08/03/19: Stakeholder called back having missed the previous call. Stated that they fish on the west coast of Tasmania and will not be affected by proposed survey. They state that there is no need for further updates	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call 07/03/19: Spectrum attempted to contact stakeholder to discuss updates. No answer, left a voicemail with contact details. This stakeholder is not considered relevant and as per the stakeholders request Spectrum will no longer consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher Shark Gillnet Sector	04/06/18 03/08/18 03/08/18	2nd formal notification 2C Fishers Phone call outgoing Email outgoing	Via phone call 03/08/18: Stakeholder requested the consultation information be re-sent.	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via email 03/08/18: At the stakeholder's request, Spectrum re-sent the consultation information.
	01/02019	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Commonwealth Southern Squid Jig Fisher	30/07/18 03/08/18 03/08/18 03/08/18	2nd formal notification 2C Fishers Email outgoing (FLO) Email outgoing (FLO) Email incoming (FLO)	No feedback received in response to the first stakeholder consultation letter. Via emails 03/08/18 FLO emailed information on the survey to [redacted] who replied stating he had concerns about the impacts of seismic on his business. Advised FLO that fishing stocks have declined after every seismic survey. He stated he was personally convinced that seismic has a big effect on fish stocks and that it must be stopped, or fishers compensated.	[redacted] objects to seismic surveys and claims that fishing stocks have declined after every seismic survey. Spectrum has already provided the fisher with information on the impact assessment for the survey, including impacts to squid (30/07/18). The letter also included control measures on compensation arrangements for the survey. No further action required.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Fisheries: Effects will be temporary as the seismic vessel traverses each survey line, and fish are expected to move away as the airgun array approaches. Localised effects on the catchability of commercially important finfish species within the survey area (pelagic or demersal) will be limited to a small radius on the seabed around the location of the airgun
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted].	To date, no response has been received to the 3rd formal notification. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Vic Rock lobster fisher	10/07/18 10/07/18	Phone call outgoing Phone call outgoing	No feedback or response received in response to the phone calls outgoing to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone calls 10/07/18: Spectrum attempted to contact the stakeholder to acquire an email address to send through the consultation information. No answer, left a message. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to attempt to contact the stakeholder to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Cth Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Shark Gillnet Sector	04/07/18 03/08/18 01/02/19	2nd formal notification 2C Fishers Phone call outgoing 3rd formal notification 3A General	No feedback or response received in response to the 2nd formal notification, phone call outgoing and 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 03/08/18: Spectrum attempted to call the stakeholder to acquire any feedback he may have on the proposed survey. No answer, left message. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: TAS Giant Crab and Rock Lobster Fisher	28/06/18 29/06/18 29/06/18 29/06/18 02/07/18	Phone call outgoing (FLO) SMS incoming (FLO) Phone call outgoing (FLO) 2nd formal notification 2C Fishers (FLO) Phone call outgoing (FLO)	Via SMS incoming 29/06/18: [redacted] SMS'd FLO asking who was paying him and referred to a recent TRLFA meeting resolution that seismic surveys should be stopped. Via phone call outgoing 02/07/18: [redacted] had previously been undertaken to send contact details fo other minor quota holders at King Island, however later texted FLO stating that he didn't want seismic and aligned with the stance of TRLFA.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call outgoing 28/06/18: FLO phoned [redacted] to discuss the proposal and discuss any concerns. They discussed other matters concerning crab biology. FLO explained the need to contact crab fishers operating from King Island and [redacted] agreed to assist with contact information. Via phone call outgoing 29/06/18: FLO phoned [redacted] to discuss the SMS and explained his role in the process. Explained other organisations that were paid to liaise with stakeholders. Via email 29/06/18: FLO sent [redacted] the Spectrum the first and second stakeholder consultation letters and high-resolution maps so that he could be informed on the survey when next contacted.
	01/02/19 04/02/19 08/03/19 08/03/19 08/03/19 08/03/19 13/03/19	3rd formal notification 3A General Email incoming Phone call outgoing Phone call incoming Phone call outgoing Email outgoing Email outgoing	Via email incoming 04/02/19: Stakeholder requested that Spectrum please correspond via their peak bodies: TSIC & TRLFA. Advices that they do a significant amount of fishing in the proposed survey area. Via phone calls 08/03/19: Stakeholder stated he would not be affected as they fish the west coast (Tasmania) and not in the proposed area. Stated they would have a look through the SCU and provide comments as necessary. Stated that TRLFA and TSIC should be consulted, Spectrum confirmed that they have been. Requested that the consultation letter be re-sent, and that updates keep being sent.	Stakeholder informed Spectrum to speak with TSIC and TRFLA. Sufficient time and information have been provided. No further action.	Via email 08/03/19: Spectrum detailed the phone conversation and re-sent the consultation letter to the stakeholder. Via email 13/03/19: Spectrum seeks confirmation that the stakeholder wants all future correspondence to occur through their representative peak bodies and all direct communication to cease. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted]: Souther Squid Jig Fisher	30/07/18 01/02/19	2nd formal notification 2C Fishers 3rd formal notification 3A General	No feedback or response received in response to the 2nd and 3rd formal notification sent to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher Shark Gillnet Sector	10/07/18 10/07/18 19/07/18	Phone call outgoing Phone call outgoing Phone call outgoing	No feedback or response received in response to the phone calls outgoing to [redacted].	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone calls 10/07/18 and 19/07/18: Spectrum attempted to contact stakeholder to acquire an email address in order to send through the consultation information. No answer, messages left. This stakeholder is considered relevant and Spectrum will continue to attempt to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to attempt to contact the stakeholder to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Fisher Scalefish Hook Sector Fisher [redacted]	06/04/18 07/04/18 12/04/18 12/04/18 01/06/18	Phone call outgoing (FLO) 1st formal notification 1A General Phone call outgoing (FLO) Email outgoing (FLO) 2nd formal notification 2C Fishers	Via phone call outgoing 06/04/18: [redacted] area of operation may include the Activity EMBA. Via email 07/04/18: FLO followed up following the phone call the day before by sending high resolution maps and the first stakeholder consultation letter and asked for feedback to mitigate potentially adverse impacts on the fishing industry. Via phone call and email 12/04/18: [redacted] confirmed that they would review the survey information. No response has been received. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter for information. No response has been received.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call outgoing 06/04/18: FLO sought contact details for the stakeholder. Was provided with a contact. Via email 07/04/18: FLO sent high resolution maps of survey footprint overlying bathymetry and requested feedback to mitigate adverse interactions Via phone call and email 12/04/18: FLO called to confirm receipt of the consultation package. The stakeholder informed FLO of new contact details. FLO re-sent stakeholder package and information. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No feedback or response received in response to the 3rd formal notification sent to [redacted].	To date, no response has been received to the 3rd formal notification. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Fisher Shark Gillnet Sector	04/07/18 03/08/18 01/02/19	2nd formal notification 2C Fishers Phone call outgoing 3rd formal notification 3A General	No feedback or response received to the 2nd and 3rd formal notifications and phone call outgoing.	No feedback or response received to the 2nd formal notification. Sufficient time and information have been provided. No further action.	Via phone call outgoing 03/08/18: Phone call to stakeholder to see if they had any feedback regarding the project. No answer, left message. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	13/02/19 13/02/19 13/02/19	Phone call outgoing Email outgoing 1st formal notification 1D new AFMA fishers	Via phone call 13/02/19: Stakeholder informed that they do not fish Otway basin under their SESSF licence but do fish the area under the VIC state Rock Lobster fishery licence. They expressed opposition to seismic testing and feel that the consultation process is just a “rubber stamp”. Requested the consultation letter be re-sent and stated they will get back to Spectrum with a response.	No feedback or response received to the 1st formal notification. Sufficient time and information have been provided. No further action.	Via email 13/02/19: Spectrum provided the stakeholder with another copy of the consultation letter This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. Spectrum appreciates your concern for the potential risks associated with the seismic survey. Spectrum have conducted an extensive risk and impact assessment for the proposed survey and will implement an extensive list of management controls listed in the consultation documents already provided. Spectrum values the consultation process as it is an important part of survey planning, and as a result of consultation with fishers, has reduced the size of the original survey area and added additional control measures to minimise disturbance and avoid displacement of fishers from their key fishing grounds. Via email outgoing 27/03/19:

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					Spectrum responded to stakeholders concerns as follows. As discussed in your phone call, it is understood you fish in the area under your Victorian Rock Lobster licence. It is also understood you feel that consultation is a 'rubber stamp' process. Spectrum appreciates your concern for the potential risks associated with the seismic survey. Spectrum have conducted an extensive risk and impact assessment for the proposed survey and will implement an extensive list of management controls listed in the consultation documents already provided. Spectrum values the consultation process as it is an important part of survey planning, and as a result of consultation with fishers, has reduced the size of the original survey area and added additional control measures to minimise disturbance and avoid displacement of fishers from their key fishing grounds. These control measures have been communicated to you in the consultation package distributed to you on the 13th February. If you do have any additional concerns regarding the proposed Spectrum Otway Deep MSS, please do not hesitate to forward your concerns through by reply email. As a fisherman under Victorian State jurisdiction, Spectrum understand that SIV represent all State fishing licence holders. SIV and Spectrum are in consultation with one another regarding this proposal. Stakeholder is considered relevant and will continue to be updated on the survey.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	05/02/19 13/02/19 13/02/19 13/02/19 06/03/19 06/03/19 08/03/19 08/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email incoming Email outgoing Phone call outgoing Phone call outgoing Phone call outgoing	Via phone call 13/02/19: Stakeholder concerned about the impact of seismic survey on crab and scallop fishery. Asked for the consultation letter to be resend and for Spectrum to contact him in a weeks' time if they haven't heard from.	Stakeholder raised concern regarding the impacts of seismic sound on crabs and Scallops. Concern merited as potential to be impacted by the survey.	Via email incoming 13/02/19: Spectrum's email to stakeholder bounced due to typo in address. Via email outgoing 13/02/19: Resent email with a summary of the phone conversation and consultation letter. Via phone call outgoing 06/03/19: Spectrum called landline with no answer. Left a message promising to call alternate line and leaving contact details Via phone call outgoing 06/03/19: Spectrum called mobile number with no answer. Left a message with contact details. Via phone call outgoing 08/03/19: Call to alternate number to obtain valid contact information. No answer but a message was left. Via phone call outgoing 08/03/19: Call to mobile number with no answer. Spectrum left a voice to text message In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to Giant Crab: Given, the giant crabs are found in <460m water depth, with spawning generally occurring within this depth range during winter (outside of the survey season), it is unlikely that there will be effects to giant crabs, or to the catch, or recruitment to the fishery. This is further supported by the most recent work on the effects of seismic on snow crab fishery catch rates, where no effect on catch rate was reported, and that if any effects these would be less than changes related to natural spatial and temporal variation (Morris et al. 2018). Scallops: Commercial scallops are mainly found at depths of 10-20 m but may also occur down to 60 m, which is shallower than the water depths of the Otway Deep MSS (175 to 3,600 m). Therefore, commercially fish scallops and wild stock scallops will not be affected by the survey due to spatial separation and do not require further assessment in this EP. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]. Southern and Eastern Scalefish and Shark Fisher, Shark Gillnet Sector, Scalefish Hook, Commonwealth Trawl	05/02/19 12/02/19 12/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing	Via phone call 12/02/19: Stakeholder stated she leases out the fishing licence and will not be directly impacted. Asked for another copy of the consultation letter so it could be passed onto their skipper.	No feedback or response received to the consultation package sent on 12/02/19. Sufficient time and information have been provided. No further action.	Via email outgoing 12/02/18: Spectrum summarised the phone call and sent another copy of the consultation letter. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Commonwealth Southern Squid Jig Fisher	11/06/18 04/08/18	2nd formal notification Email outgoing	No feedback or response received in response to the 2nd formal notification and email outgoing .	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 08/03/19 08/03/19	3rd formal notification 3A General Phone call outgoing Email outgoing	Via phone call 08/03/19: Receptionist confirmed stakeholder email address and requested the information be re-sent. Stated that they would be in touch if they felt the need to comment or if it affected them.	No objections or claims. Sufficient time and information have been provided. No further action.	Via email 08/03/19: Spectrum emailed with a record of the phone conversation and to re-send the consultation information.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	11/06/18 11/07/18 02/08/18 03/08/18 03/08/18 09/08/18 09/08/18 23/08/18 30/08/18	2nd formal notification 2A General Meeting Phone call outgoing (FLO) Email outgoing (FLO) Phone call outgoing Email incoming (FLO) Email outgoing (FLO) Email incoming Email outgoing	No feedback received in response to the first stakeholder consultation letter. Via meeting with Spectrum 11/07/18: [redacted] stated he was not opposed to oil and gas but did not wish to be affected by the seismic survey. Advised Spectrum he is also a scallop fisher and was badly affected by the 2010 survey that disrupted the scallop fishery, and didn't want the squid to be affected the same way. He stated he was concerned whether the noise will affect the squid closer to shore. He noted the importance of the Bonney Upwelling and is aware of the McCauley paper regarding seismic impacts on plankton. He stated that he has no concerns about the OBN component of the survey. Via email 09/08/18: Provided Spectrum with their completed survey question template. Via email 23/08/18: Stakeholder emailed to follow up from the meeting on the 11th of July and further discussions. Enquired as to whether their concerns had been conveyed to NOPSEMA in Spectrum's EP and as to the next step in addressing these concerns. Attached completed questionnaire template.	Stakeholder expressed concerns the noise impacts of the survey would affect squid and scallops. Concern is merited due to stakeholders potential to be affected by the survey as a squid fisher. Action: Spectrum to respond to stakeholder concerns and ensure they have been adequately addressed in the EP	Via phone call 02/08/18: FLO phoned to notify [redacted] he had been appointed to facilitate consultation with SSJF fishers. Via email 03/08/18: FLO sent information materials to [redacted], including map, questionnaire and the second stakeholder consultation letter. The letter contained summary information from the impact assessment that covered squid and scallops. Via phone call 03/08/18: FLO followed up with [redacted] who returned from overseas, updated them on the materials that had been sent. They said they would look through them over the weekend. No further feedback provided. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process. Via email outgoing 09/08/18: FLO acknowledged receipt of stakeholders questionnaire and confirmed it has been lodged in the record of correspondence which goes to the regulator NOPSEMA. Via email 30/08/18: Spectrum thanked stakeholder for their feedback and confirmed that concerns received before the 5th Aug were included in the submitted EP. Provided their response to the SIV report for the stakeholder to review while they reviewed his questionnaire responses. Spectrum appreciates your concern for the potential risks associated with the seismic survey. Spectrum have conducted an extensive risk and impact assessment for the proposed survey and will implement an extensive list of management controls listed in the consultation documents already provided.
	01/02/19	3rd formal notification 3A General	No feedback or response received.	To date, no response has been received to the 3rd formal notification. Sufficient time and information have been provided. No further action.	
	08/04/19	Email outgoing	No feedback or response received.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.	Via email 08/04/19: Spectrum advised stakeholder that they are following up on queries and conversations regarding the Spectrum Otway Deep Marine Seismic Survey. The stakeholder's comments regarding the effect of seismic on scallops from the 2010 seismic survey in the Gippsland and the relevance to squid in the Otway have been considered and included in the final consultation report to NOPSEMA. We provide information taken from the EP that we believe addresses stakeholder's concerns on squid in the Otway, and would be happy to provide stakeholder with the full EP impact assessment extract if requested. Information provided to stakeholder: McCauley et al. (2000) studied captive squid (*Sepioteuthis australis*) responses during a seismic survey, where squid showed a strong startle response to nearby air-gun start up and evidence that they would significantly alter their behaviour at an estimated 2 to 5 km from an approaching seismic source. Squid showed avoidance of the airgun by keeping close to the water surface at the cage end furthest from the airgun, appearing to make use of the sound shadow measured near the water surface (an almost 12 dB difference) (McCauley et al. (2000)). Several researchers have also noted that squid show fewer alarm responses with subsequent exposure to the seismic source (McCauley et al. 2000; Fewtrell and McCauley 2012; Mooney et al. 2016) and, in minimising impacts to squid, McCauley

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
					and Fewtrell (2012) have suggested that a ramped (i.e. gradual increase in signal intensity) airgun signal and prior exposure to airgun noise decreases the severity of the alarm responses in squid. The soft-start (and 'ramping up') procedures that will be employed during the seismic survey will therefore aid in reducing the extent and severity of the alarm responses in squid. Fishing intensity maps for the SSJF shown in Figure 6.4 indicate partial overlap between fishing areas and the MSS area. However, the extent of this overlap is likely to be exaggerated because the process of generating the fishing intensity maps requires smoothing and spreading of estimated fishing effort that results in the total fishing area appearing larger than reality (ABARES 2017). The total catch of squid by the SSJF in 2017 was 213 tonnes (ABARES 2018). In contrast, pooled catch for the ten year period 2008-2017 within the operational area (data pooled for confidentiality reasons) was 366 tonnes (SETFIA 2018). For this same ten year period 12, 17 and 13 SSJF vessels recorded catches during March, April and May from within the operational area, respectively (SETFIA 2018). Data for other months was not available due to confidentiality reasons, prohibiting direct assessment of squid catch potentially impacted by the MSS. However, as noted in the previous section, the area of potential Gould's squid habitat within the survey area (to 825 m) that may be targeted by the SSJF is 800 km2, which is 0.2% of the broader area open to this fishery. Squid are also caught by demersal trawling as incidental catch in the CTS, although in recent years catches of squid in this fishery have been greater than that for the SSJF (ABARES 2018). In 2017 569 t of squid were captured by the CTS (ABARES 2018). Operators within the CTS are prohibited from fishing most areas of the SESSF deeper than 700 m (as well as other areas described in the Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016[1]), although in the West Acquisition Area the boundary of the prohibited area extends to more than 2,500 m (as further described below in Section 6.1.4.4). The area of potential habitat for Gould's squid within the survey area (to a depth of 825 m) that is open to trawling is 700 km2, which is 0.5% of the total habitat for this species open to trawling across the area of the CTS (149,036 km2) and 1.0% of the total habitat for this species open to trawling west of Tasmania. Limiting the area to west of Tasmania is based on stakeholder feedback about fishing operations (Appendix C), and assumes operators fishing in this area do not trawl in areas east of Tasmania. Analysis of CTS catch data for the period 2008 – 2017 (data pooled for confidentiality reasons) indicates that Gould's squid comprised 10% of the total catch within the operational area of the MSS (SETFIA 2018). However because the operational area is larger and overlaps more area fished by the CTS than does the survey area, the amount of squid catch potentially impacted by seismic activities during the MSS will be considerably lower than indicated by this percentage. Based on the above assessment, the survey area represents a minor portion of the area actively fished for squid by the SSJF and CTS, and limited impact on catches are expected as a consequence of survey activities (for assessment of displacement impacts refer to Section 6.3). This is further supported by information provided by Carroll et al. (2017), who tested the potential effects on catch rates or abundances on cephalopods and found no significant differences between sites exposed to seismic operations and those not exposed. The biomass of squid that may be subjected to seismic activity is expected to be small compared to the biomass of the broader stock, and squid in the area are expected to move away as the airgun array approaches and move back to the area and resume normal feeding behaviour once the seismic source has passed. Squid within the area of the Bonney Upwelling will not be affected as it is 24.5 km to the north of the survey, and no mortality or injury to squid is anticipated as a consequence of the MSS.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Cth Southern And Eastern Scalefish And Shark Fisher Gillnet Hook and Trap Sector Fisher Scalefish Hook Sector	11/06/18 01/02/19 08/03/19	2nd formal notification 2A General 3rd formal notification 3A General Phone call outgoing	No feedback or response received in response to the 2nd and 3rd formal notifications and phone call outgoing to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via phone call 08/03/19: Spectrum attempted to call to discuss any concerns that the stakeholder may have. No answer. Left a voicemail. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Southern And Eastern Scalefish And Shark Fisher	05/02/19 14/02/19 14/02/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing	Via phone call 14/02/19: Stakeholder stated that they concerned about conflicts of access during the survey. Informed that they do not fish in the Otway Basin all year, but do not want to lose access during times they do fish. Requested a copy of the consultation letter and requested for future correspondence to be conducted via email to ensure a record of communications.		Via email 14/02/19: Spectrum supplied the stakeholder with the consultation package and confirmed that all future correspondence would take place via email. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Commercial fishers actively operating in the survey area and will be issued a 7 to 10 day forecast prior to activities commencing in the survey area
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Commonwealth Southern Squid Jig Fisher	11/06/18 04/08/18	2nd formal notification 2A General 2nd formal notification 2C Fishers	No feedback or response received in response to the 2nd formal notifications sent to [redacted]	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 08/03/19 08/03/19 08/03/19	3rd formal notification 3A General Phone call outgoing Email outgoing Email outgoing	Via phone call 08/03/19: Stakeholder stated that they have a Small Pelagic Licence and a squid licence but will not be affected by the survey as they are currently not fishing. However, they may in the future and so would like to be kept updated.	No objections or claims. Spectrum will continue to keep the stakeholder updated.	Via emails 08/03/19: Spectrum followed up the phone conversation with emails documenting the conversation and assuring the stakeholder that they would continue to provide the stakeholder with any updates to the proposal.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Commonwealth Southern Squid Jig Fisher [redacted]	03/07/18 31/07/18 01/08/18 01/08/18 01/08/18	Second formal notification 2A General Second formal notification 2C Fishers Phone call outgoing (FLO) Phone call outgoing (FLO) Email outgoing (FLO)	Via phone call outgoing 01/08/18: FLO Rang and spoke with [redacted] and who said he would read the information that had been emailed. No feedback or response received.	To date, no response has been received in regard to consultation material the stakeholder has been provided with. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No response received in response to the 3rd formal notification sent to [redacted]	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher [redacted]	11/06/18 31/07/18 02/08/18 03/08/18 06/08/18	2nd formal notification 2A General 2nd formal notification 2C Fishers Phone call outgoing (FLO) Email outgoing (FLO) Phone call incoming (FLO)	Via phone and email 02/08/18 to 03/08/18: FLO phoned [redacted], no answer so followed up with an email with general project information attached including a questionnaire. Via phone 06/08/18: [redacted] discussed previous adverse experiences with seismic surveys. Advised FLO they would return the questionnaire to Spectrum. No feedback or response received.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No response received in response to the 3rd formal notification sent to [redacted]	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	05/02/19 06/02/19 07/02/19	3rd formal notification 3B AFMA	No response received in response to the 3rd formal notifications and phone calls outgoing to [redacted].	No feedback provided. Reasonable opportunity has been given for response. No action required.	Via phone call outgoing 06/02/19: Spectrum called stakeholder to obtain email to send consultation package. No answer but message left to call back

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Phone call outgoing 3rd formal notification 3B AFMA			Via letter outgoing 07/02/19: Spectrum sent a consultation package to the stakeholder by post.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	01/02/19 11/02/19 11/02/19 12/02/19 12/02/19 13/02/19 13/02/19 01/03/19 01/03/19 01/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Phone call outgoing Email outgoing Email outgoing Email incoming Email incoming Phone call outgoing Phone call outgoing Email outgoing	Via phone call 11/02/19: Stakeholder requested the information be re-sent. Stated that they are a quota holder and leases their licences out, but that they fish close to the area. Stated they would look at the information to determine whether they will be affected. Via emails 13/02/19: Stakeholder confirmed receipt of the information.	Stakeholder requested for information to be resent. Request merited. Spectrum resent the consultation material on the 12th February 2019.	Via phone call 11/02/19: Spectrum called stakeholder to discuss the proposed survey. Confirmed they would re-contact the stakeholder after they had looked at the information. Via emails 12/02/19: Re-sent the 3rd formal notification to the stakeholder as requested. Via phone calls 01/03/19: Spectrum attempted to contact the stakeholder to seek feedback and discuss concerns. No answer, left a voicemail. Via email 01/03/19: Spectrum sent an email detailing the attempted phone calls
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Tasmanian Giant Crab Fisher	29/03/18 01/06/18 27/06/18	Phone call outgoing (FLO) 2nd formal notification 2C Fishers Meeting (FLO)	Via phone call outgoing 29/03/18: FLO called [redacted] to introduce himself and the proposal. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter – fisheries. Via meeting 27/06/18: FLO met with [redacted] to discuss their feedback. [redacted] expressed concern about impacts to the giant crab fishery and the follow-on effect to their business. He explained it was just starting to come back after the last seismic survey 10-12 years ago. He noted that crabs were sensitive to shock and suggested trapping before and after the survey to determine if there are any impacts and the extent of impacts across the fishery.	[redacted] expressed concerns about the noise impacts of their survey on the giant crab fishers and suggested trapping to measure impacts from the survey. Concerns merited as potential to be impacted by survey. Action: Spectrum to address stakeholders concern and ensure it is considered in the EP impact assessment for giant crabs. Action: Spectrum to review the suggestion to conduct trapping and determine if it will be pursued.	A summary of the noise impacts to giant crab and the control measures that Spectrum have adopted was provided to [redacted] on 01/06/18. Spectrum have considered the location and timing of the survey in relation to giant crab areas and following further consultation with crab fishers and has moved the south-eastern boundary of the survey area further offshore outside giant crab biological depth range. Spectrum have considered surveys of the type suggested and determined that given they require significant resources and are unlikely to distinguish potential impacts due to seismic activity (if present) from natural processes, they will not be adopted. In response to your concerns we bring your attention to the part of the information package that addresses the merit of your concerns. Impacts to Giant Crab: Given, the giant crabs are found in <460m water depth, with spawning generally occurring within this depth range during winter (outside of the survey season), it is unlikely that there will be effects to giant crabs, or to the catch, or recruitment to the fishery. This is further supported by the most recent work on the effects of seismic on snow crab fishery catch rates, where no effect on catch rate was reported, and that if any effects these would be less than changes related to natural spatial and temporal variation (Morris et al. 2018).
	08/02/19 14/03/19	3rd formal notification 3A General Email outgoing	No response received in response to the 3rd formal notification and email outgoing sent to [redacted].	No feedback provided in response to email sent on 14/03/19. Action: Spectrum will deal with any concerns of questions raised from the email sent on 14/03/19 in ongoing consultation.	Via email outgoing 14/03/19: Spectrum responded to stakeholders concerns and suggestions concerning the impact of the proposed seismic survey on Giant Crab stock. Spectrum communicated that the boundaries of the survey had been reduced and provided an updated figure. By reducing the survey area displacement and interference is minimised. Survey acquisition area limited to deeper than 800 m meaning crabs in habitat adjected to SA and TAS state waters will not be impacted and so trapping surveys will not be undertaken. Impact of seismic survey on reproduction expected to be minimal due to spawning occurring outside of the survey period (May to August), egg release peaking during October and plankton dispersal via currents. This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Southern And Eastern Scalefish And Shark Fisher	01/02/19 12/02/19 12/02/19	3rd formal notification 3A General Phone call outgoing Email outgoing	Via phone call 12/02/19: Stakeholder informs that they rarely fish in the Otway Basin. Confirmed there is a possibility that they may fish there over the next three years and the survey may affect them. Informed that they are a member of SETFIA and would prefer any future communication to come through them.	Stakeholder informed Spectrum that consultation material will come through SETFIA.	Via phone call 12/02/18: Spectrum called to discuss the proposed survey. In response to the stakeholders request for communication via SETFIA, Spectrum confirmed that the stakeholder would receive no further direct communication other than a follow-up email. Via email 12/02/19: Follow-up email documenting the call and confirming future communication arrangements.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	04/07/18 03/08/18 03/08/18	2nd formal notification 2C Fishers Phone call outgoing Email outgoing	Via phone call 03/08/18: Asked to be re-sent information. No concerns raised.	Stakeholder requested to be resent information Spectrum resent information to the stakeholder.	Via email 03/08/18: Spectrum re-sent the consultation information to the stakeholder.
	01/02/19 14/03/19	3rd formal notification 3A General Email outgoing	No response received in response to the 3rd formal notification and email outgoing sent to [redacted]	No feedback provided in response to email sent on 14/03/19. Action: Spectrum will deal with any concerns of questions raised from the email sent on 14/03/19 in ongoing consultation	Via email outgoing 14/03/19: Spectrum responded to stakeholders concerns and suggestions concerning the impact of the proposed seismic survey on Giant Crab stock. Spectrum communicated that the boundaries of the survey had been reduced and provided an updated figure. By reducing the survey area displacement and interference is minimised. Survey acquisition area limited to deeper than 800 m meaning crabs in habitat adjected to SA and TAS state waters will not be impacted and so trapping surveys will not be undertaken. Impact of seismic survey on reproduction expected to be minimal due to spawning occurring outside of the survey period (May to August), egg release peaking during October and plankton dispersal via currents. This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted]: Southern And Eastern Scalefish And Shark Fisher Commonwealth Trawl Sector Fisher and Small Pelagic Fisher [redacted]	07/04/18 03/08/18 04/08/18	1st formal notification 1A General Phone call outgoing 2nd formal notification 2C Fishers	Via phone call 03/08/18: An employee stated that generally [redacted] responds quickly to these kinds of emails if they are going to affect him. If there is no response he is probably not affected. No feedback or response received.	To date, no response has been received in regard to the consultation material the stakeholder has been provided. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 14/02/19 14/02/19 18/03/19	3rd formal notification 3A General Phone call outgoing Email outgoing Phone call outgoing	Via phone call 14/02/19: Stakeholder informed that they were not forwarded Spectrum's survey information. Provided personal contact details to re-send, and informed that they would email a response. Via phone call 18/03/19: Stakeholder stated that he was unsure where the Otway basin was and to contact his skipper [redacted] instead. Spectrum informed stakeholder that consultation had been undertaken with [redacted] and is continuing to be undertaken. Stakeholder stated he was unsure of his fishing areas and stated to continue consultation with [redacted].	Stakeholder referred Spectrum to speak with his skipper ([redacted]) who has been in consultation with Spectrum about this proposal.	Via email 14/02/19: Spectrum emailed the consultation package to the new contact address. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Southern Squid Jig Fisher **Refer also to* [redacted]	11/06/18 22/10/18 01/02/19	2nd formal notification – 2A General 2nd formal notification 2C Fishers 3rd formal notification 3A General	No feedback received in response to the 2nd and 3rd formal notifications sent to [redacted]	No objections or claims. Spectrum will respond to the submission by [redacted]	This stakeholder is considered relevant and Spectrum will continue to consult with them via [redacted] as part of the ongoing consultation process.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern Squid Jig Fisher	11/06/18 04/08/18 01/02/19 08/03/19 08/03/19	2nd formal notification 2A General 2nd formal notification 2C Fishers 3rd formal notification 3A General Phone call outgoing Email outgoing	Via phone call 08/03/19: Spoke with employee who was unsure of consultation as she has been out of the office for a few months. Stated that they are in the squid jig fishery and also hold a licence for tuna and swordfish. Pretty sure they would not be affected but will pass on details to Stakeholder to confirm/comment as necessary. No feedback or response received in response to the 2nd and 3rd formal notifications sent to [redacted] on 11th June and 4th August 2018 and 1st February 2019.	To date, no response has been received. Sufficient time and information have been provided. No further action.	Via email outgoing 08/03/19: Spectrum sent an email to the Stakeholder recording call to their office and asking them for comment. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Southern And Eastern Scalefish And Shark Fisher	01/02/19 14/02/19 14/02/19 06/03/19 06/03/19 06/03/19	1st formal notification 1D new AFMA fishers Phone call outgoing Email outgoing Phone call outgoing Phone call outgoing Email outgoing	Via phone call 14/02/19: Stakeholder informed that they were a quota holder only and confirmed that they will not be directly impacted since that the boats using his licence do not fish Otway Basin. However, they do ferry though the proposed survey site, and would like time to read through the document. No concerns raised.	Stakeholder has claimed they transit through the area of the proposed survey area and will need to be kept informed regarding timing and location of the vessel. Request merited due to operation through the survey area and potential disruption. Sufficient time and information have been provided. Action: continue to send updates to [redacted] regarding the proposed survey.	Via email 14/02/19: Spectrum sent a follow-up email to the stakeholder summarising their phone call in which the stakeholder stated that they he will not be directly impacted and that the boats using his licence do not fish Otway Basin. Spectrum also provided contact details for if they have any concerns. Via phone calls 06/03/19: Spectrum attempted to call stakeholder to discuss any concerns they may have after reading through the consultation information. No answer, left a voicemail. Via email 06/03/19: Spectrum sent an email detailing attempted calls and request for any comments. [redacted] is considered a relevant stakeholder and will continue to receive updates regarding the proposed Otway Deep MSS.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
[redacted] Commonwealth Squid Jig FIsher	12/07/18 12/07/18 01/02/19	Phone call outgoing 2nd formal notification 2C Fishers 3rd formal notification 3A General	Via phone call 12/07/18: Spectrum phoned the stakeholder to discuss the proposed survey and attain an email address for further consultation material to be sent to them. Stakeholder provided Spectrum with email address for consultation material to be sent through to.	No claims or concerns raised in events. Sufficient time and information have been provided. No further action.	Via phone call 12/07/18: Spectrum called stakeholder to inform them of the proposed survey. [redacted] is considered a relevant stakeholder and will continue to receive updates regarding the proposed Otway Deep MSS.
		Ongoing consultation: Spectrum will continue to provide project updates to stakeholder and respond to any objections or claims raised in accordance with the ongoing consultation process described in Section 9.0 of this EP.			
Tourism and recreation					
[redacted]	13/07/18 13/07/18	Phone call outgoing 2nd formal notification 2A General	Via phone call 13/07/18: Stakeholder discussed the proposed survey with Spectrum. No issues were raised.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call 13/07/18: Spectrum called stakeholder to discuss the proposed survey.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
Australian Anglers Association (Victorian Division) Inc. [redacted]	19/07/18 19/07/18 20/07/18 22/07/18 23/07/18	Phone call outgoing 2nd formal notification 2A General Email outgoing Email incoming Email outgoing	Via phone 19/07/18: Stated that they would forward the information on to their members. Advised that members get out into deeper waters and there is growing interest in fishing for broadbill out in the deeper waters, and this can occur all year depending on the weather. Via email 22/07/18: The stakeholder provided contact details for VRFish. No feedback provided.	No objections or claims. Sufficient time and information have been provided. No further action.	Via emails 19/07/18 and 23/07/18: Spectrum provided a copy of the first stakeholder consultation letter and encouraged [redacted] to provide feedback. Thanked stakeholder for VRFish contact details. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Charters	13/07/18 13/07/18	Phone call outgoing 2nd formal notification 2A General	Via phone call 13/07/18: Stakeholder discussed the proposed survey. No issues were raised.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call 13/07/18: Spectrum called stakeholder to discuss the proposed survey.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
Game Fishing Association of Victoria [redacted]	19/07/18 19/07/18	Phone call outgoing 2nd formal notification 2A General	Via phone 19/07/18: Advised that information would be passed onto association members however doesn't think any will be affected. Has requested to be kept informed about the survey.	No objections or claims. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
[redacted] Fishing Charters	13/07/18 13/07/18	Phone call outgoing 2nd formal notification 2A General	Via phone call 13/07/18: Stakeholder discussed the proposed survey. No issues were raised. Stakeholder expressed interest in providing their vessel to the survey.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call 13/07/18: Spectrum called stakeholder to discuss the proposed survey.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
[redacted] Fishing Charters	13/07/18 13/07/18	Phone call outgoing 2nd formal notification 2A General	Via phone call 13/07/18: Stakeholder discussed the proposed survey. No issues were raised. Provided information on fishing location and depths.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call 13/07/18: Spectrum called stakeholder to discuss the proposed survey.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
[redacted] Sportfishing Club [redacted]	19/07/18 19/07/18 30/07/18 31/07/18 02/08/18	Phone call outgoing Second formal notification Email incoming Email outgoing Email outgoing	Via phone call 19/07/18: Advised that the club regularly fish out to 5-600 m. Has advised that all information will be passed onto their members. Has requested to be kept informed about the survey. Via email incoming 31/07/18: [redacted] sportfishing club responded to the letter with queries regarding: Whether there is data/history identifying or negating impacts of seismic on fishing Whether recreational fishers will receive the same notifications as commercial fishers Enquiring whether it was possible to get a more detailed sea floor chart focussing between SA border and Warrnambool to better assist understanding of the exact area that may be affected in relation to their current fishing areas The size of exclusion zones surrounding seismic and support vessels during the survey How fishers will identify survey boats They requested that Spectrum respond before their next meeting on the 8th of August if possible.	Stakeholder's concerns on the impacts of seismic on fishing and request for more detailed survey information are merited. Merited as a representative of recreational fishers who may also be affected by survey. Action: Spectrum to respond to [redacted] queries.	Via email 19/07/18: Spectrum followed phone call up with an email, attached the first stakeholder consultation letter and encouraged feedback. Via email 02/08/18: In response to [redacted] queries, Spectrum provided responses via email covering the queries raised: There is data from previous surveys, although these are broad in nature. The key areas of potential overlap with fishing activity is along the continental slope and shelf break. Spectrum will be managing its operations to minimise the survey time on shelf waters so as to minimise displacement to fishers. The impacts due to the proposed seismic study are predicted to be short-term and localised, and will not have population-scale impacts of significance to fisheries. Spectrum has updated the survey notification schedule to ensure that relevant recreational fishing groups will receive email notifications at four weeks, 5 days, at commencement of survey and within 10 days of survey completion. No such map as the one requested by [redacted] fishing club is available. Spectrum has however attached another map showing the broad survey area split into three areas. A support vessel will be with it all the time whilst the streamers are out to manage any interaction with other vessels, and a cautionary zone of 5 km radius from the seismic vessel and gear is standard for the industry. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
[redacted] Fishing Charters	13/07/18 13/07/18 13/07/18 08/02/19	Phone call outgoing 2nd formal notification 2A General Phone call incoming 3rd formal notification 3A General	Via phone call incoming 13/07/18: Stakeholder called Spectrum to discuss the proposed survey. No issues were raised.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call outgoing 13/07/18: Spectrum attempted to call stakeholder to discuss the proposed survey. No answer, so left a message for the stakeholder to call back.
[redacted] Angling Club [redacted]	19/07/18 19/07/18	Phone call outgoing 2nd formal notification 2A General	Via phone 19/07/18: Advised that their members rarely fish out as far as the survey. Will continue to pass on all information to members of the association. Has requested to be kept informed about the survey.	Request to be kept informed on the survey is merited due to the [redacted] Angling Club representing members of the associated who have the potential to be affected by the survey. Spectrum will keep the stakeholder updated on survey Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
[redacted] Charters [redacted]	13/07/18 13/07/18	Phone call outgoing 2nd formal notification 2A General	Via phone call 13/07/18: Advised that the charter operation is based in Melbourne however they do operate some three-day charters to King Island. Has requested to be kept informed about the survey.	Request to be kept informed on the survey is merited due to the potential for [redacted] Charter to be impacted when operating to King Island. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
[redacted] Fishing Charters	13/07/18 13/07/18 16/07/18	Phone call outgoing Phone call outgoing 2nd formal notification 2A General	Via phone call 13/07/18: Stakeholder discussed the proposed survey with Spectrum. No issues were raised.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call 13/07/18: Spectrum attempted to call stakeholder with no answer. Left a message for the stakeholder to call back. Via phone call 13/07/18: Spectrum called stakeholder to collect a contact email address to send consultation information to.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.
[redacted] Charters [redacted]	13/07/18 13/07/18 13/07/18 08/02/19	Phone call outgoing 2nd formal notification 2A General Phone call incoming 3rd formal notification 3A General	Via phone call incoming 13/07/18: Stakeholder called Spectrum to discuss the proposed survey. They discussed the proposal. No issues were raised.	No objections or claims. Sufficient time and information have been provided. No further action.	Via phone call outgoing 13/07/18: Spectrum attempted to call stakeholder with no answer. Left a message for the stakeholder to call back.
[redacted] Charters [redacted]	13/07/18 13/07/18	Phone call outgoing 2nd formal notification 2A General	Via Phone Call 13/07/18: No issues raised however has requested to be kept informed about the survey.	Request to be kept informed is merited due to the potential for [redacted] Charters to be disrupted by the survey Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	08/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered to be relevant and will continue to receive project updates from Spectrum.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
Research and conservation					
Blue Whale Study Inc [redacted]	09/02/18 09/02/18 09/02/18 01/06/18	1st formal notification 1A General Email incoming Email incoming 2nd formal notification 2D Research	Via email 09/02/18: Acknowledged receipt of information with no further comments received.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	Blue Whale Study Inc. is a relevant stakeholder and will continue to receive project updates from Spectrum.
Deakin University [redacted]	09/02/18 09/02/18 28/02/18 28/02/18 01/06/18	1st formal notification 1A General Email incoming Email outgoing Email outgoing 2nd formal notification 2D Research	Via email 09/02/18: In response to the first stakeholder consultation letter, [redacted] (Associate Professor of Marine Science, Warrnambool Campus) advised that he could be consulted on behalf of Deakin University and that he is also deputy node leader for the south east Australian Integrated Marine Observing System (IMOS). Requested further details on operational plans and considerations.	[redacted] requested further information on operational considerations. Request for further information is merited due to consultation position at Deakin University and south east Australian Integrated Marine Observing System. Action: Spectrum to provide information on operational aspects of the survey.	Via emails outgoing 28/02/18: In response to [redacted] response for further information Spectrum provided a summary of the activity. Spectrum noted that planning was still in the early stages and there are certain aspects that will not be possible to finalise until closer to the time of the survey (e.g. specific timing of the survey), and thus cannot be provided until they are finalised. Spectrum provided maps of the location and advised that the impact and risk assessment in the EP will consider the full extent of the survey area (i.e. area of 23,620 km^2). Noted that Spectrum have engaged Jasco Applied Sciences to carry out the underwater noise modelling for the impact assessment. The modelling is currently underway and once completed, the results and associated assessment of impacts to marine fauna receptors will be communicated to stakeholders. The EP impact assessment will address potential impacts to all marine fauna receptors that could be affected by seismic sound generated during the survey, including potential impacts to key biological activities e.g. aggregation, migration, foraging, breeding/calving, nesting/inter-nesting and fish spawning, and areas identified as biologically important for these activities for particular species. Spectrum stated that once target areas for the seismic data acquisition within the defined survey area are known to a reasonable level of certainty they will be communicated to stakeholders as part of the ongoing consultation process. Spectrum noted that [redacted] is the node leader for the south east Australian Integrated Marine Observing system, and stated that they would appreciate provision of any data/information and/or key papers/studies on the values and sensitivities within the survey area/region, to inform the impact assessment. Via email 01/06/18: Spectrum sent the second stakeholder consultation letter. No feedback or response received. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19	3rd formal notification 3A General	No response received.	No feedback provided. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
Institute of Marine and Antarctic Science (IMAS)	21/02/18 01/06/18 01/02/19	1st formal notification 1A General 2nd formal notification 2D Research 3rd formal notification 3A General	No feedback or response received.	To date, no response has been received. Sufficient time and information have been provided. No further action.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
Oil and gas industry					
3D Oil	29/03/18 29/03/18 29/03/18 29/03/18	1st formal notification 1C Industry Operators Email incoming	Via emails incoming 29/03/18: In response to the stakeholder consultation letter, 3D Oil acknowledged receipt and advised that it is committed to carrying out the Dorrigo MSS in Q4 2018, and stated that they are happy to keep	No objections or claims. Reasonable opportunity has been given for response. No action required.	Via emails 29/03/18: Spectrum requested to be kept updated on the progress of 3D Oil's Dorrigo MSS activities and advised that Spectrum will similarly ensure 3D Oil is kept updated as planning for the Otway Deep MSS progresses. 3D Oil provided Spectrum with their notification schedule.

Relevant stakeholder	Date	Method	Summary of relevant stakeholder feedback	Assessment of merit	Summary of spectrum response
	29/03/18 Email incoming Email outgoing Email outgoing	Email incoming Email outgoing Email outgoing	communication open with Spectrum regarding survey planning to work out the best outcome for both surveys. They provided information on the Dorigo MSS, which is located in Exploration Permit T/49P, which lies approximately 18 km west of King Island and 56 km south of Cape Otway. Water depths across the survey area vary from 80-1420 m. The survey, expected to take up to 35 days to complete, is currently planned in the period October 1, 2018 to April 30, 2019.		If the timing of the proposed surveys overlaps, then Spectrum will work with 3D Oil to avoid discharging the airguns within 40 km of each other. If timesharing is required for both surveys, Spectrum stated that they should be able to find a mutually-agreeable solution given that Otway Deep MSS is intended to comprise long lines away from 3D Oil's area of interest and thus will not always be within 40km of their survey polygon.
	01/06/18	2nd formal notification 2A General	No response received.	No objections or claims. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
	01/02/19 06/02/19 07/02/19	3rd formal notification 3A General Email outgoing Email incoming	Via email 07/02/19: 3D Oil acknowledges receipt of the updated information on the survey timing.	No objections or claims. Reasonable opportunity has been given for response. No action required.	Via emails 06/02/19 and 07/02/19: Spectrum informed 3d Oil, of changes to the timeframe for the Otoway Deep Marine Seismic Survey, and that there are no further changes. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
Beach Energy	27/03/18 04/04/18 04/04/18 09/04/18	1st formal notification 1C Industry Operators Email outgoing Email incoming Email outgoing	Via email 04/04/18: Advised that the appropriate people from Beach Energy had been informed. Nominated a Beach Energy contact to consult as planning for the Otway Deep MSS progresses and advised that they will be in touch in due course with any further requests.	No objections or claims. Reasonable opportunity has been given for response. No action required.	Via email 04/04/18: Spectrum followed up their 1st formal notification to Beach Energy, requesting a confirmation of receipt, and enquiring as to any potential concerns or queries. Via email 09/04/18: Spectrum thanked Beach Energy for putting them in touch with the Beach Energy contact and stated that they would keep them informed with the status of the Otway Deep MSS program. Spectrum will continue to keep Beach Energy informed via their nominated contact.
	01/06/18	2nd formal notification 2A General	No response received.	No objections or claims. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and Spectrum will keep them informed on the survey.
	01/02/19 06/02/19 07/02/19 07/02/19	3rd formal notification 3A General Email outgoing Email incoming Email outgoing	Via email 07/02/19: Beach Energy informed Spectrum that their planned activities may overlap with the time and location of Spectrum's survey. Enquires as to an agreement between Beach and Spectrum which is expiring soon.		Via email 06/02/19: Spectrum informed Beach Energy, of changes to the timeframe for the Otway Deep Marine Seismic Survey, and that there are no further changes. Via email 07/02/19: Spectrum notes Beach Energy's planned activity addresses the issue of the expiring agreement. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.
Cooper Energy	27/03/18 04/04/18 06/04/18 06/04/18 09/04/18	1st formal notification 1C Industry Operators Email outgoing Email incoming Email outgoing Email incoming	Via emails 06/04/18 to 09/04/18: Cooper Energy requested clarification regarding Spectrum's window of activity and likely timing of acquisition. Once clarification was provided advised that no activities are currently planned in VIC/P44 during the proposed survey window. Requested that they be kept informed on the Otway Deep MSS in case their plans change. Highlighted that although Spectrum's activities would not be encroaching on VIC/L24 and VIC/L30, the Joint Venture has subsea facilities (well heads, flowlines and Umbilical's) within these areas.	Cooper Energy's request for clarification on window or activity and timing of acquisition is merited due to their planned activity which has potential to overlap. Spectrum provided clarification on window of activity. Reasonable opportunity has been given for response. No action required.	Via email 04/04/18: Spectrum followed up their First formal notification to Cooper Energy, requesting a confirmation of receipt, and enquiring as to any potential concerns or queries. Via email 06/04/18: Spectrum clarified Spectrum's window of activity and likely timing of acquisition and thanked Cooper Energy for their response.
	11/06/19	2nd formal notification 2A General	No response received.	No objections or claims. Reasonable opportunity has been given for response. No action required.	This stakeholder is considered relevant and Spectrum will keep them informed on the survey.
	01/02/19 06/02/19 06/02/19	3rd formal notification 3A General Email outgoing Email incoming	Via email 06/02/19: Cooper Energy acknowledges receipt of the updated information on the survey timing.	No objections or claims. Reasonable opportunity has been given for response. No action required.	Via email 06/02/19: Spectrum informed Beach Energy, of changes to the timeframe for the Otway Deep Marine Seismic Survey, and that there are no further changes. This stakeholder is considered relevant and Spectrum will continue to consult with them as part of the ongoing consultation process.