SapuraOMV Upstream (Western Australia) Pty Ltd.

Kanga-1 Geophysical and Geotechical Site Survey Environmental Plan

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DOCUMENT RECORD & MANAGEMENT

DOCUMENT INFORMATION

Document No:	AU-HSE-KG1-EX-PLN-003	**Revision:**	0
Document Owner:	MC	**Department Owner:**	HSE Department

CURRENT REVISION APPROVALS

Action	Name	Position	Initial	Date
Prepared by	GHD Pty Ltd	-		03/06/2020
Reviewed by	MC	Senior HSE Specialist		03/06/2020
Endorsed by	RB	Drilling Manager		03/06/2020
Approved by	ZZ	Country Manager		03/06/2020

REVISION / AMENDMENT RECORD

Rev	Date	Prepared By	Reviewed	Endorsed	Approved	Description
A	04/05/2020	GHD Pty Ltd	MC, RB, ZZ	-	-	Issued for review
B	21/05/2020	GHD Pty Ltd	MC, RB, ZZ	-	-	Issued for review
0	03/06/2020	GHD Pty Ltd	MC	RB	ZZ	Submission to NOPSEMA

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Environment Plan Summary

This Kanga-1 Geophysical and Geotechnical Site Survey Environment Plan (EP) summary has been prepared from material provided in this EP. The summary consists of the following as required by Regulation 11(4) of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R):

EP Summary Material Requirement	Relevant EP Section
Details of the titleholders nominated liaison person for the activity	**Section 1.4**
The location of the activity	**Section 3.1**
A description of the activity	**Section 3**
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LIST OF ACRONYMS

Abbreviation	Description
ABARES	Australian Bureau of Agricultural and Resource Economics
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AHO	Australian Hydrographic Office
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
APPEA	Australian Petroleum Production & Exploration Association
ASBTIA	Australian Southern Bluefin Tuna Industry Association
AUV	Autonomous Underwater Vehicle
BIA	Biologically Important Area
BoM	Bureau of Meteorology
BWMC	Ballast Water Management Certificate
BWMP	Ballast Water Management Plan
BWMS	Ballast Water Management System
CFA	Commonwealth Fisheries Association
CMID	Common Marine Inspection Document
CMR	Commonwealth Marine Reserve
CO_2	Carbon Dioxide
CPT	Cone Penetration Test
DAWE	Department of Agriculture, Water and the Environment
dB	Decibel
DBCA	Department of Biodiversity, Conservation and Attractions
DFAT	Department of Foreign Affairs and Trade
DISER	Department of Industry, Science, Energy and Resources
DMIRS	Department of Mines, Industry Regulation and Safety
DNP	Director of National Parks
DNV	Det Norske Veritas
DoT	Department of Transport
DP	Dynamic Positioning
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
ECR	Environmental Commitments Register

Abbreviation	Description
EEZ	Exclusive Economic Zone
EMBA	Environment that May be Affected
ENVID	Environmental Impact Identification
EP	Environment Plan
EPBC	Environment Protection and Biodiversity Conservation
EPO	Environmental Performance Outcome
EPS	Environmental Performance Standard
ESD	Ecologically Sustainable Deverlopment
GHG	Greenhouse Gases
GPS	Global Positioning System
HFO	Heavy Fuel Oil
HSE	Health, Safety and the Environment
HSEMS	Health, Safety and Environmental Management System
IAPP	International Air Pollution Prevention
IFO	Intermediate Fuel Oil
IFAW	International Fund for Animal Welfare
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organisation
IMT	Incident Management Team
IOPP	International Oil Pollution Prevention
ISPP	International Sewage Pollution Prevention
JRCC	Joint Rescue Coordination Centre
JSA	Job Safety Analysis
KEF	Key Ecological Feature
MAH	Monocyclic Aromatic Hydrocarbon
MBES	Multi-beam Echo Sounder
MDO	Marine Diesel Oil
MEZ	Moderate Exposure Zone
MFO	Marine Fauna Observer
MNES	Matter of National Environmental Significance
MoC	Management of Change
ms	millisecond
NE	Northeast
NEBA	Net Environmental Benefit Analysis
nm	Nautical Mile
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority

Abbreviation	Description
NOPTA	National Offshore Petroleum Title Administrator
NOx	Nitrogen Oxides
NSW	New South Wales
NTM	Notice to Mariners
NW	Northwest
NWMR	North-West Marine Region
NWS	Northwest Shelf
ODS	Ozone-depleting Substances
OPEP	Oil Pollution Emergency Plan
OPGGSA	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSMP	Operational and Scientific Monitoring Plan
OVID	Offshore Vessel Inspection Database
OWR	Oiled Wildlife Response
OWRP	Oiled Wildlife Response Plan
OWS	Oily Water Separator
PK	Peak Sound Pressure Level
PMS	Planned Maintenance System
PMST	Protected Matters Search Tool
POLREP	Marine Pollution Report
PPA	Pearl Producers Association
PTW	Permit to Work
Q4	Quarter 4
RMS	Root Mean Square Sound Pressure Level
ROV	Remotely Operated Vehicle
SapuraOMV	SapuraOMV Upstream (Western Australia) Pty Ltd
SBP	Sub-bottom Profiling
SDS	Safety Data Sheet
SEL	Sound Exposure Level
SMPEP	Ship Marine Pollution Emergency Plan
SOPEP	Ship Oil Pollution Emergency Plan
SOx	Sulphur Oxides
SPL	Sound Pressure Level
SPRAT	Species Profile and Threats
SSS	Side Scan Sonar
STP	Sewage Treatment Plant

Abbreviation	Description
UXO	Unexploded Ordnance
VOC	Volatile Organic Compounds
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WAOWRP	Western Australia Oiled Wildlife Response Plan

1. Introduction

1.1 Activity Overview

SapuraOMV Upstream (Western Australia) Pty Ltd (SapuraOMV) proposes to undertake the Kanga-1 geophysical and geotechnical site survey (site survey) in exploration permit area WA-412-P, located in the Dampier sub-basin (Northern Carnarvon Basin). The permit area is wholly within offshore Commonwealth waters, and the operational area is approximately 163 km north northwest of Karratha, Western Australia (WA), in water depths of approximately 147 m (**Figure 1-1**).

This Environment Plan (EP) has been prepared in accordance with the requirements of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage Act 2006 and the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R), for acceptance by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

1.2 Purpose

The purpose of this EP is to demonstrate that:

- The environmental impacts and risks (planned and unplanned) associated with the survey are identified;
- Appropriate management controls are identified and implemented; and
- Environmental impacts and risks will be reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

This EP defines activity-specific environmental performance outcomes, standards and measurement criteria and provides an implementation strategy that will be used to measure and report on environmental performance during planned activities and unplanned events. This EP also documents and considers all relevant stakeholder consultation performed during the planning of the activity.

1.3 Scope

This EP covers all petroleum operations within the operational area for the activity. The scope of this EP does not include the survey vessel transiting to and from the operational area or any other activities outside the operational area. The survey vessel is deemed to be operating under the Commonwealth *Navigation Act 2012* and not performing a petroleum activity during transit.

The primary objective for the site survey is the acquisition of site-specific geophysical and geotechnical data in the operational area, to help identify surface and shallow subsurface characteristics of the area, including presence of potential geohazards.

In accordance with Regulation 19 of the OPGGS(E)R, this EP remains valid from NOPSEMA acceptance for a period of five years or until NOPSEMA has accepted an end-of-operation of the EP notification under Regulation 25A of the OPGGS(E)R or SapuraOMV revises this EP.

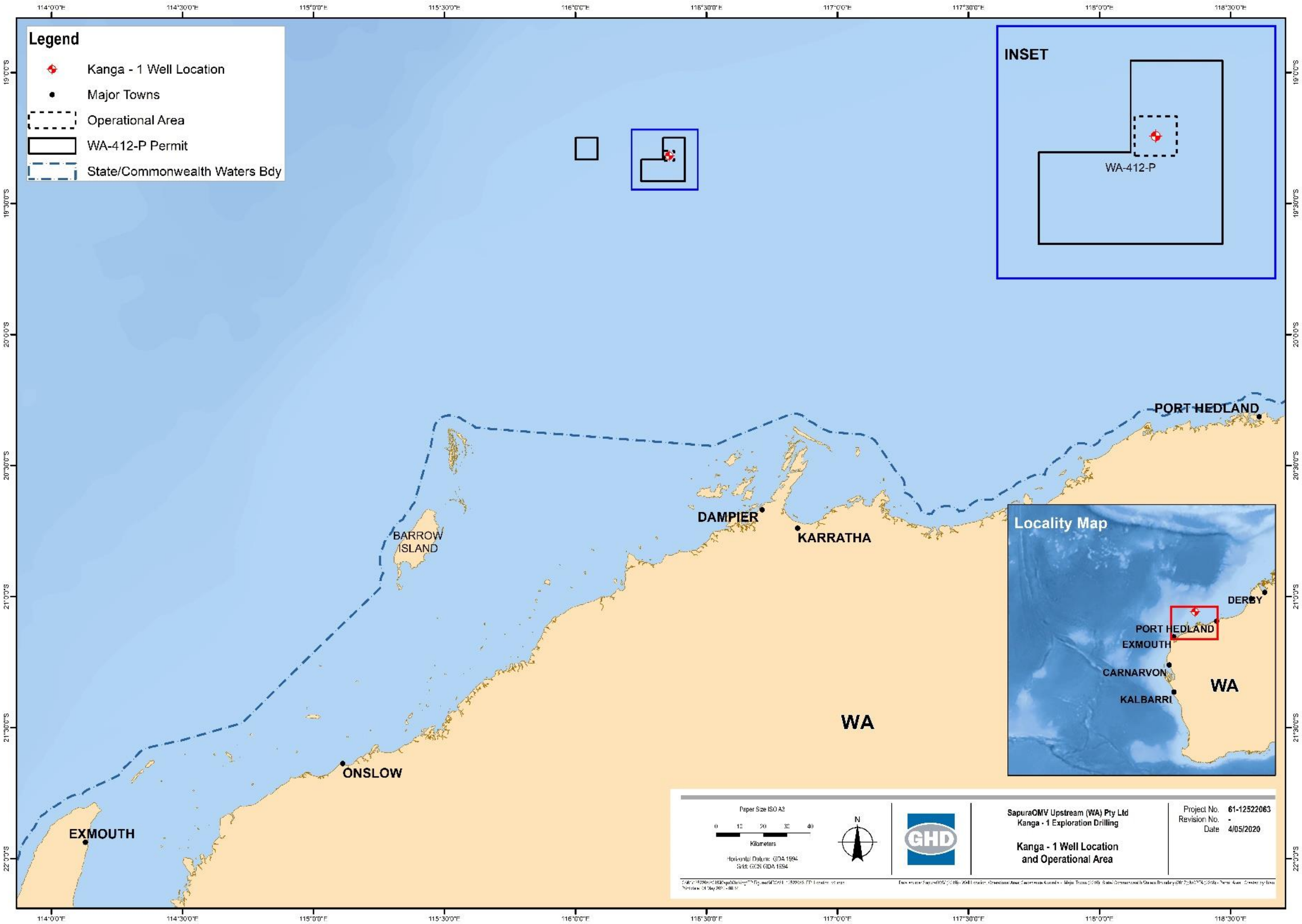


Figure 1-1 Location of WA-412-P and Kanga-1 operational area

1.4 Titleholder Details

The participating interests in WA-412-P are presented in **Table 1-1** and the liaison person is provided in **Table 1-2**. If there is a change in the titleholder, the titleholder's nominated liaison person or the contact details for the titleholder or liaison person, SapuraOMV will notify NOPSEMA in accordance with Regulation 15(3) of the OPGGS(E)R. Specifically, a written notification including any changes will be provided to NOPSEMA as soon as practicable after the change occurs.

Table 1-1 Titleholder participating interests and operatorship

Title	Titleholder	Titleholder for Activity
WA-412-P	SapuraOMV 70% (ABN 37 629 043 518)	SapuraOMV
	Finder No 9 Pty Ltd 30% (ACN 150236445)	

Table 1-2 Titleholder nominated liaison person

Nominated Liaison Person	
Name	Zamin Zawawi
Position	Country Manager
Business address	SapuraOMV Upstream (WA) Pty Ltd Level 2, 251 St Georges Terrace Perth, WA 6000
Telephone number	+61 8 6118 4990
Email address	kanga.australia@sapura-omv.com

2. Environmental Management Framework

2.1 Environmental Management Policy

The site survey will be conducted in accordance with SapuraOMV's Health, Safety and Environment (HSE) Policy (**Appendix A**), inclusive of the relevant EP sections where the legislation may prescribe or control how an activity is undertaken.

SapuraOMV's HSE Policy sets the direction and minimum expectations for environmental performance, and is implemented through the standards and procedures of the Health, Safety and Environmental Management System (HSEMS) (HSE-MM-MAN-0001). This system and policy are further described in **Section 9** in accordance with Regulation 16(a) of the OPGGS(E)R.

2.2 Legislative Framework

In accordance with Regulation 13(4) of the OPGGS(E)R, the legislative framework, applicable industry standards and guidelines relevant to the survey are listed in **Appendix B.**

3. Description of the Activity

3.1 Location and Timing

3.1.1 Operational Area

The operational area defines the spatial boundary of the survey. The operational area is approximately a 4 km x 4 km (16 km^2) area (**Figure 1-1**), with a water depth of ~147 m, and is defined by the coordinates in **Table 3-1.**

Table 3-1 Operational area coordinates

Latitude	Longitude
-19° 20' 07.27" S	116° 20' 18.28" E
-19° 17' 57.06" S	116° 20' 18.28" E
-19° 17' 57.06" S	116° 22' 35.31" E
-19° 20' 07.27" S	116° 22' 35.31" E

3.1.2 Activity Timing

The geophysical and geotechnical site survey is anticipated to occur between January 2021 and November 2021, and may take up to 14 days (excluding weather and operational delays). Timing will be contingent on the availability of a suitable vessel, weather and environmental approvals.

3.2 Survey Activities

3.2.1 Geophysical Investigations

The geophysical investigations will collect data for assessment of water depths, seabed topography, seabed conditions and identification of obstructions on the seabed. The proposed techniques may include the following, as described in **Table 3-2** and schematically shown in **Figure 3-1**:

- Multi-beam echo sounder (MBES);
- Side scan sonar (SSS);
- Sub-bottom profiling (SBP); and
- Magnetometer.

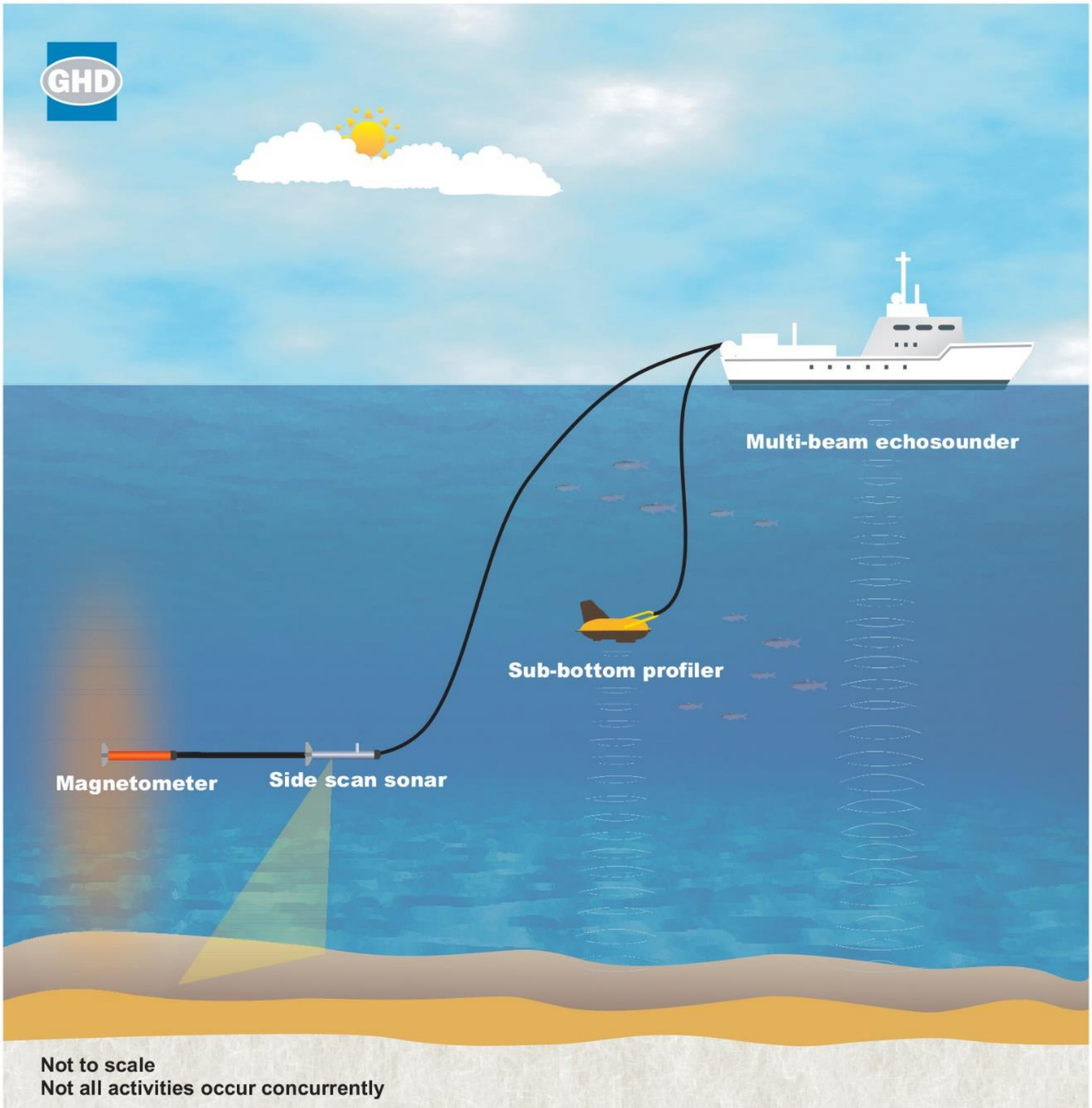


Figure 3-1 Geophysical investigation techniques

Table 3-2 Description of geophysical investigations

Activity	Purpose	Details
Multi-beam echo sounder (MBES)	Used to undertake detailed measurements of water depth (bathymetry) in the operational area.	MBES', like other sonar systems, transmit acoustic energy (sound) and analyses the return signal (echo) that has bounced off the seafloor or other objects. MBES' may be mounted on the vessel hull or towed. The multi-beam principle of operation is in general based on a fan-shaped acoustic pulse directed towards the seafloor. The reflection of the acoustic energy by the seabed is computed to determine the depth and the transversal distance to the centre of the ensonified area. The coverage area on the seafloor is dependent on the equipment type and settings, and the depth of water. Typically coverage is two to four times the water depth. Water depth data from the echo sounder is then combined with Global Positioning System (GPS) data, giving the position of the instrument in order to evaluate absolute bathymetry.
Side scan sonar (SSS)	Used to detect hazards in the operational area such as debris, subsea infrastructure (e.g. existing pipelines and cables), unmarked wrecks, boulders, craters and reefs.	SSS is a method of underwater imaging using narrow beams of acoustic energy (sound) transmitted out to the side of a 'towfish' or equivalent (e.g. an autonomous underwater vehicle (AUV) or a remotely operated vehicle (ROV)) across the seabed. The transducers produce a high frequency pulse of sound energy in the shape of a fan that sweeps the seafloor. The return signal (echo) is reflected from the seafloor and other objects. The strength of the return echo is continuously recorded creating a picture of the ocean bottom which can be used to give an indication of the texture of the seabed. Hard objects reflect more energy causing a dark signal on the image; soft objects that do not reflect energy as well show up as lighter signals. The absence of sound such as shadows behind objects show up as white areas on a sonar image.
Sub-bottom profiling (SBP)	Used to investigate the layering and thickness of the uppermost seabed sediments.	Acoustic SBP systems are used to determine physical properties of the seafloor and to create an image and characterise geological information below the seafloor. SBPs usually consist of a sound source that sends pulses into the shallow sub-seafloor sediments. They produce an acoustic profile which extends from the seabed down to the limit of penetration. Geophysical surveying uses a variety of profilers which operate at differing energy levels and are characterised by different dominant frequencies. Higher energy sources are needed to transmit the acoustic signals to greater depths. Due to the relatively shallow depth below the seabed required to be surveyed, SBP is expected to require a relatively low energy acoustic source.
Magnetometer	Used to determine whether there are any shallow buried metallic objects in the operational area (e.g. shipwreck debris, anchors, buried infrastructure, pipelines and cables, and dropped objects such as unexploded ordnance (UXO)) that may not be detected by acoustic means.	Electromagnetic surveys are conducted using magnetometers either in a single array or in a gradiometer array with multiple magnetometers towed in parallel. Magnetometers are towed behind a vessel or are mounted on an AUV or the vessel hull and measure magnetic field strength. This is done by monitoring the electron and proton interaction within the magnetometers. Magnetometers contain a liquid rich in hydrogen atoms, like kerosene or methanol. In the presence of a ferrous substance such as UXO, there is a transfer of energy from the electrons to the protons in the hydrogen atoms which indicates a ferrous substance on the seafloor.

3.2.2 Geotechnical Investigations

The objective of the geotechnical investigations is to assess and characterise seabed conditions within the operational area, including calibrating and interpreting geophysical results. The proposed techniques may include the following, as described in **Table 3-3** and schematically shown in **Figure 3-2**:

- Piston coring or vibracore sampling;
- Cone Penetration Test (CPT); and
- Box core sampling.

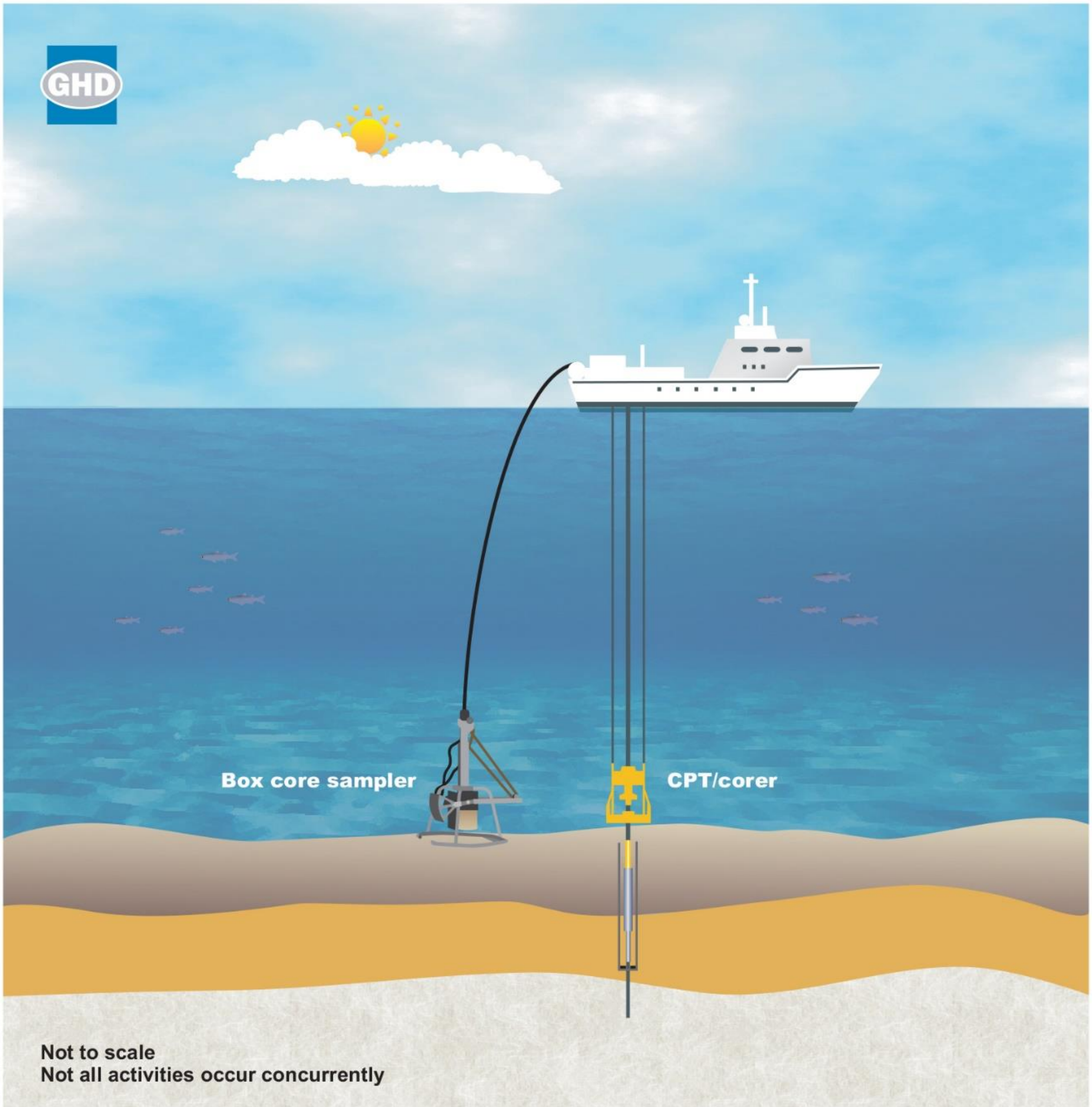


Figure 3-2 Geotechnical investigation techniques

Table 3-3 Description of geotechnical investigations

Activity	Purpose	Details
Piston coring or vibracore sampling	Coring samples are obtained from the ocean's floor, specifically from sub-strata sediments.	Seabed cores may be obtained for analysis using a variety of vessel-deployed equipment such as vibracoring or piston coring. Coring units are deployed (and recovered) from a vessel using a suitable A-frame or crane. Coring samples are used to ground truth the geophysical data. Vibracoring Vibracoring is a technique for collecting core samples in harder, unconsolidated sediments. The vibracoring unit is lowered to the seabed and electrical power is supplied to the vibrating head through an umbilical. The head then vibrates the core down through the sediment layers to reach the required depth of the core sample. Piston coring The piston corer is used for collecting core samples in areas of soft, unconsolidated sediments. The piston corer is lowered to the seafloor using a wire rope. Once a trigger device hits the seafloor it causes the core barrel to release the corer, allowing it to freefall. As the barrel enters the sediment, an internal piston creates a vacuum that helps to draw the core into the barrel for recovery of the core sample. Number of sample locations: 24 - 36 Target depth: 6 – 20 m Total footprint: 48 – 72 m^2
Cone Penetration Test (CPT)	Used to determine soil strength and to help to delineate soil stratigraphy (rock layering).	The CPT unit consists of a rod fitted with a cone-shaped tip at the distal end to measure soil resistivity and pore pressure. The CPT unit is deployed from a vessel using an A-frame or crane and lowered to the seabed. At the seafloor, as the rod is hydraulically pushed into the seabed, measurements are sent back to the vessel and recorded on a computer. CPT can typically take between 30 minutes and several hours, depending on the seabed conditions and the required penetration depth. Number of sample locations: 24 - 36 Target depth: 2 – 20 m Total footprint: 120 - 180 m^2
Box core sampling	A geological sampling tool for soft sediments, designed to minimise disturbance of the sediment surface.	A box core is used to collect samples from soft, unconsolidated sediment. The corer is lowered to the seabed and then the instrument is triggered by a trip as the main coring stem passes through its frame. The stem has a weight of up to 800 kg to aid penetration. While pulling the corer out of the sediment a spade swings underneath the sample to prevent loss of the core. Number of sample locations: 24 - 36 Target depth: 0 - 2 m Total footprint: 48 – 72 m^2

3.3 Vessel Activities

The Kanga-1 geophysical and geotechnical investigations may be undertaken by the same vessel or by separate vessels. However, there will only be one vessel in the operational area at any one time. The specific vessel(s) to undertake the site survey has not yet been confirmed, but will be mobilised from within Australia. The largest single fuel tank on any vessel to be used for the survey will contain no more than 200 m^3 of fuel. No vessel refuelling or crew change will occur in the operational area.

While undertaking geophysical data acquisition in the operational area, the survey vessel will travel no faster than 6 knots. For the geotechnical investigations, the vessel will be stationary and use dynamic positioning (DP) to maintain position. There will be no anchoring of the survey vessel.

4. Description of the Environment

4.1 Background

In accordance with Regulation 13(2) of the OPGGS(E)R, this Section describes the physical, ecological and social receptors of the environment that may be affected (EMBA). In determining the spatial extent of the environmental sensitivities that may be affected by the activity, SapuraOMV has considered the area likely to be affected from planned activities and unplanned events.

4.2 Environment that May be Affected

The EMBA for the activity has been defined on the basis of a maximum credible hydrocarbon spill event (**Section 8.1** accidental release of marine diesel oil (MDO) from a vessel collision). Spill modelling of this event used the NOPSEMA Bulletin #1 Oil Spill Modelling (NOPSEMA, 2019a) low hydrocarbon contact values of four oil phases (surface, dissolved, total submerged, accumulated shoreline) that pose differing environmental risks to define the outer extent of the EMBA.

The EMBA has been used to identify the environmental receptors that may be contacted by surface and subsurface hydrocarbons in the highly unlikely event of a worst case oil spill. Low contact values that have been used to inform the extent of the EMBA (**Table 4-1**) are useful for establishing scientific monitoring parameters and identifying potential socio-economic impacts; however, they may not be ecologically significant (NOPSEMA, 2019a). Therefore, in addition to the EMBA, a moderate exposure zone (MEZ) has also been derived from stochastic spill modelling using hydrocarbon contact levels identified by NOPSEMA Bulletin #1 (NOPSEMA, 2019a) as having the potential to cause impacts to receptors (**Table 4-1**).

The information provided in this Section was sourced from peer reviewed journals, and government and industry reports. The key sources of information referred to in this Section are from the Department of Agriculture, Water and the Environment (DAWE) resources and published literature. These resources were used to identify ecological, heritage, socio-economic and cultural environments, their associated values and sensitivities, and their presence in the MEZ and EMBA. These key sources included, but are not limited to:

- An EPBC Act Protected Matters Database search was conducted to identify listed threatened and migratory species, and Threatened Ecological Communities potentially occurring in the operational area, MEZ and EMBA (**Appendix C**);
- Species Profile and Threats (SPRAT) Database, which includes information about species, ecological communities and key ecological features (KEFs) protected under the EPBC Act; and
- National Conservation Values Atlas, which includes information on Biologically Important Areas (BIAs) for protected species under the EPBC Act.

The assessment of potential impacts from a spill considered those values and sensitivities identified within the MEZ. Figures presented in the EP display this level of detail.

It is important to note that the MEZ and EMBA represent probabilistic areas of moderate and low NOPSEMA thresholds of hydrocarbon presence, respectively, over 120 stochastic simulations across five years for all seasonal environmental conditions. As such, the actual area affected by any single spill event would be considerably smaller than the area represented by the MEZ or EMBA (**Figure 4-1**).

Table 4-1 Oil spill thresholds to define the MEZ and EMBA (NOPSEMA, 2019a)

Hydrocarbon Phase	Contact Values	
	MEZ	EMBA
Accumulated Shoreline	100 g/m^2 Area likely to cause environmental impacts and to require clean-up effort	10 g/m^2 Potential for some socio-economic impact
Instantaneous Surface	10 g/m^2 Lower limit for harmful contact to birds and marine mammals	1 g/m^2 Approximates socio-economic effects and planning area for scientific monitoring
Instantaneous Dissolved	50 ppb Potential toxic effects, particularly sub-lethal effects to sensitive species	10 ppb Planning area for scientific monitoring as potential water quality trigger exceedance
Total submerged oil	100 ppb To inform risk evaluation	10 ppb Planning area for scientific monitoring as potential water quality trigger exceedance

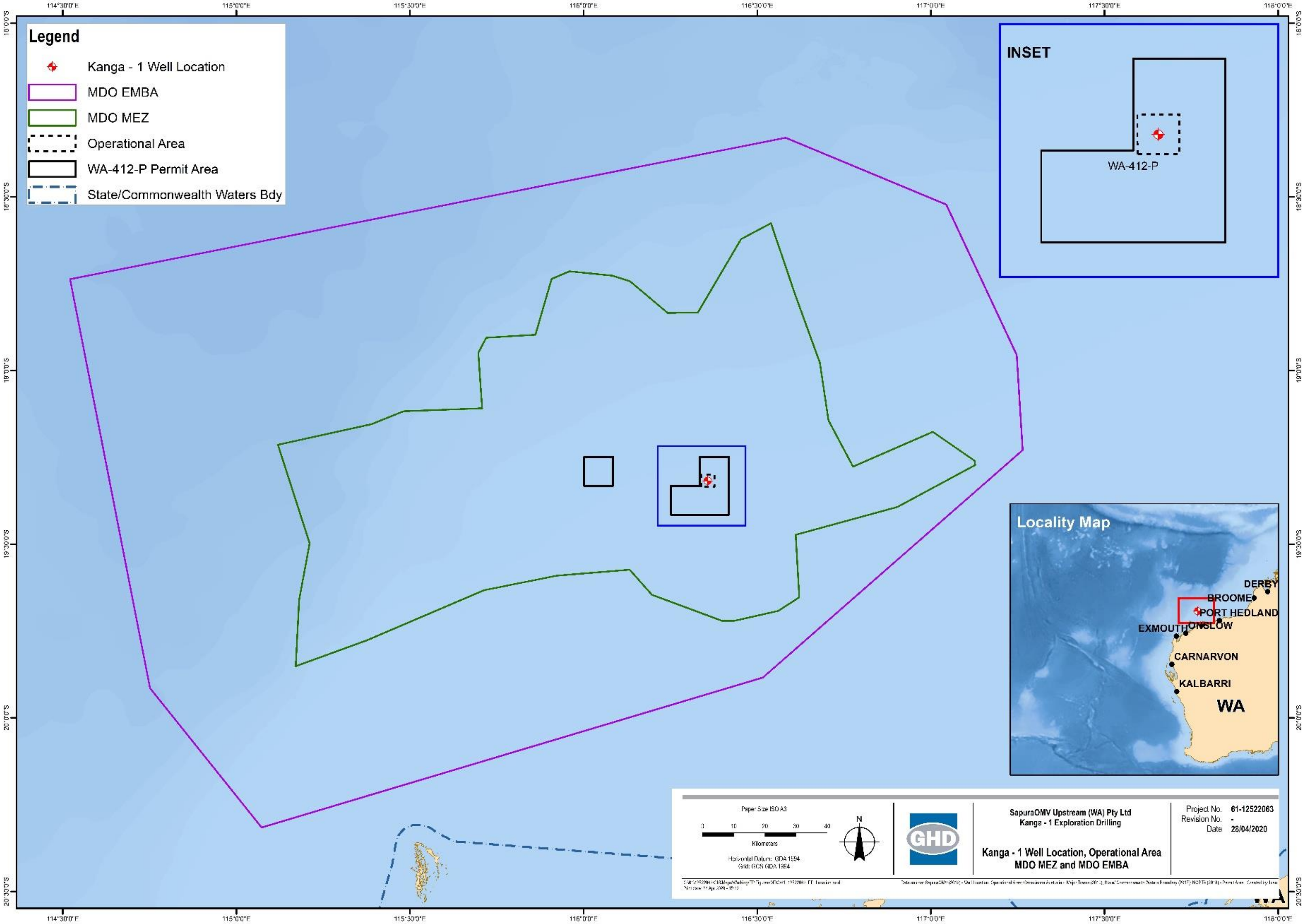


Figure 4-1 Kanga-1 site survey MEZ and EMBA

4.3 Regional Overview

Australia's offshore waters have been divided into six broad marine bioregions in order to facilitate their management by the Australian Government under the EPBC Act. Marine Bioregional Plans describe the marine environment and conservation values of each marine region, set out broad biodiversity objectives, identify regional priorities and outline strategies and actions to address these priorities.

The operational area, MEZ and EMBA are located entirely within the North-West Marine Region (NWMR). Based on the Integrated Marine and Coastal Regionalisation of Australia (IMCRA), Version 4.0 (CoA, 2006), the operational area is located within the Northwest Shelf Province, while the MEZ and EMBA also overlap the Northwest Province and Northwest Transition (**Figure 4-2**).

The Bioregional Plan for the NWMR (DSEWPaC, 2012a) has been used in conjunction with other relevant management plans, reports and published papers to inform the description of the existing environment.

4.3.1 North-West Marine Region

The NWMR comprises Commonwealth waters from the Western Australia–Northern Territory border to Kalbarri, south of Shark Bay. The region's north-western boundary is defined in accordance with the Perth Treaty negotiated with the Republic of Indonesia and includes areas over which Australia exercises jurisdiction over both the water column and the seabed and its associated resources (DSEWPaC, 2012a).

The NWMR is characterised by shallow-water tropical marine ecosystems with high species richness. High diversity is partly driven by the interaction between seafloor features and the currents of the region. The high species richness is also thought to be associated with the diversity of habitats available. The region has generally low productivity, with boom and bust cycles driven by monsoonal seasonality. Because the region is relatively shallow, surface currents exert a strong influence, and the region is dominated by the Indonesian Throughflow. Another important factor driving the ecological processes in the region is the strong seasonality in wind direction and rainfall. One of the most unusual and significant oceanographic features of the region is the occurrence of internal waves. Internal waves are large in amplitude and encourage the mixing of surface waters with deeper, more nutrient-rich waters, which is important for biological productivity in the region (DSEWPaC, 2012a).

4.3.1.1 Northwest Shelf Province

This provincial bioregion is located primarily on the continental shelf between North West Cape and Cape Bougainville. It varies in width from about 50 km at Exmouth Gulf to more than 250 km off Cape Leveque. About half the bioregion has water depths of only 50–100 m. The bioregion is a dynamic oceanographic environment, influenced by strong tides, cyclonic storms, long-period swells and internal tides. Its waters derive from the Indonesian Throughflow, are warm and oligotrophic, and circulate throughout the bioregion via branches of the South Equatorial and Eastern Gyral Currents (DEWHA, 2008a).

Fish communities are diverse and both benthic and pelagic fish communities appear to be closely associated with different depth ranges. Humpback whales migrate through the bioregion and Exmouth Gulf is an important resting area, particularly for mothers and calves on their southern migration. A number of important seabird breeding sites are located in the bioregion (but adjacent to Commonwealth waters), including Eighty Mile Beach, the Lacepede Islands, and Montebello and Barrow islands. The bioregion is important for the petroleum industry and also supports commercial fishing operations. The nationally significant ports of Dampier and Port Hedland operate in this bioregion (DEWHA, 2008a).

4.3.1.2 Northwest Province

This provincial bioregion occurs offshore between Exmouth and Port Hedland and consists entirely of continental slope. Water depths generally range between 1000–3000 m. The dominant geomorphic feature is the Exmouth Plateau, while the Montebello Trough and Swan Canyon are also important features. It contains the steepest shelf break in the marine region along the Cape Range Peninsula near Ningaloo Reef. Circulation and recirculation (via the South Equatorial Current) of Indonesian Throughflow waters comprise the dominant surface flow. The predominantly southward moving surface waters consolidate along the narrow shelf break adjacent to Cape Range Peninsula to form the Leeuwin Current, a significant feature of this bioregion and those further south (DEWHA, 2008a).

The canyons in this bioregion probably channel currents onto the Exmouth Plateau and certainly onto the shelf along Ningaloo Reef, resulting in enhanced localised biological production. The Northwest Province represents the beginning of a transition between tropical and temperate marine species. High endemism in demersal fish communities on the slope is also evident in this provincial bioregion. Commercial fishing and petroleum are important industries in some parts of the bioregion (DEWHA, 2008a).

4.3.1.3 Northwest Transition

This provincial bioregion includes shelf break and continental slope and the majority of the Argo Abyssal Plain included in the NWMR. Key topographic features include the Mermaid, Clerke and Imperieuse Reefs, all of which are marine reserves and together constitute the Rowley Shoals. Surface circulation of Indonesian Throughflow waters occurs both via direct southward movement of the Throughflow itself, and recirculation of Throughflow waters via the South Equatorial Current. Cyclone incidence is high in this bioregion during summer months (DEWHA, 2008a).

Little is known about benthic biological communities in the deeper parts of the provincial bioregion, although high levels of species diversity and endemism have been identified among demersal fish communities on the continental slope. The Rowley Shoals are biodiversity hotspots in the bioregion and the steep change in slope around them attracts a range of pelagic migratory species including billfish, sharks, tuna and cetaceans. Commercial fishers operate within the bioregion and it may increase in importance for the petroleum industry in the future (DEWHA, 2008a).

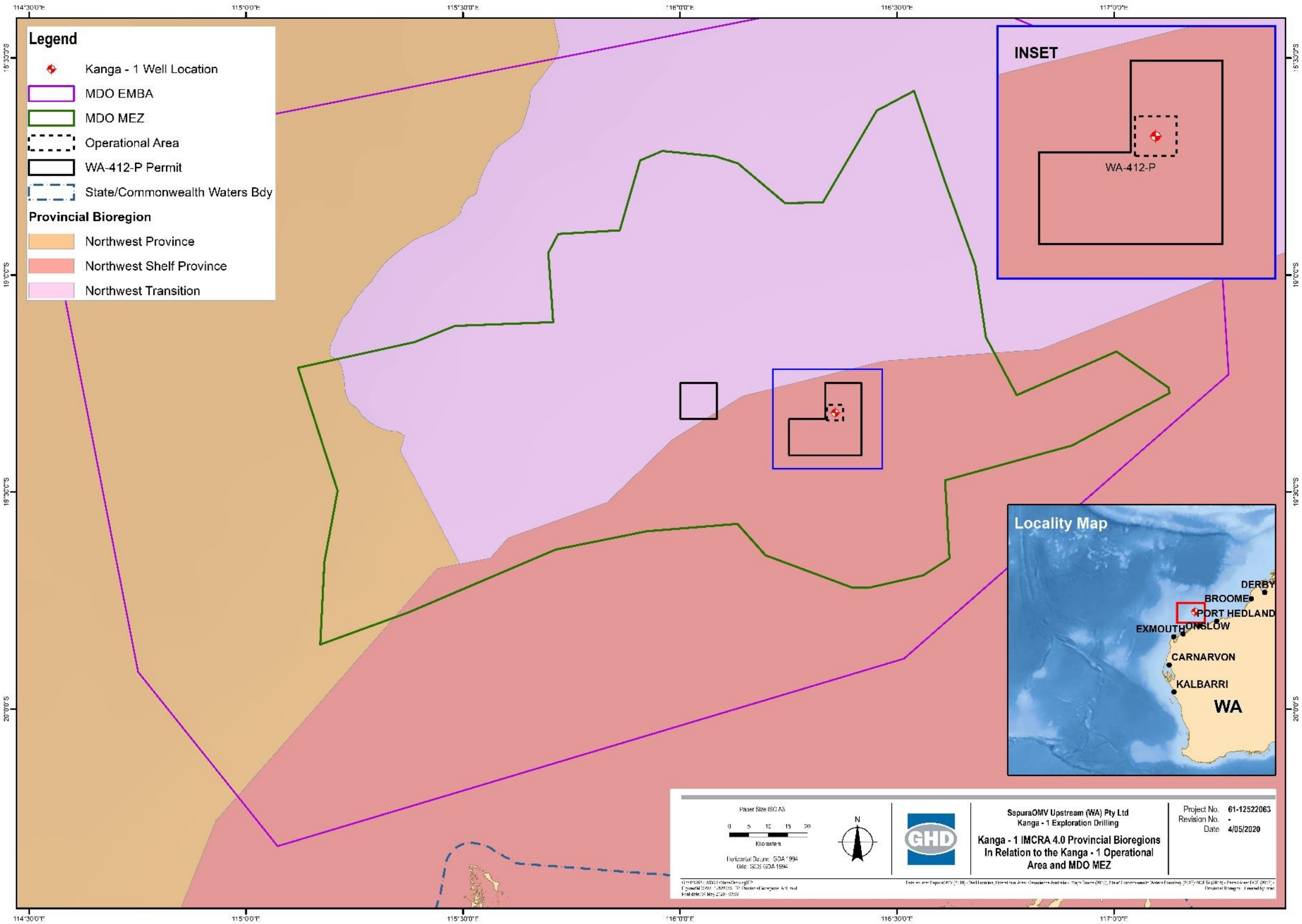


Figure 4-2 IMCRA 4.0 Provincial bioregions in relation to the operational area and MEZ

4.4 Conservation Values and Sensitivities

4.4.1 Matters of National Environmental Significance

4.4.1.1 Listed Threatened and Migratory Species

A Protected Matters Search Tool (PMST) report identified 14 listed threatened species and 30 listed migratory species as having the potential to occur within the operational area (**Table 4-2**; **Appendix C**). The distribution, migratory movements and preferred habitat of these species is further described in **Section 4.6**.

Recovery Plans, Management Plans and Conservation Advice

Recovery Plans set out the research and management actions necessary to stop the decline of and support the recovery of listed threatened species. Conservation Advice provides guidance on immediate recovery and threat abatement activities that can be performed to facilitate the conservation of a listed species or ecological community. **Table 4-3** summarises the Recovery Plans and Conservation Advices relevant to those species identified by the EPBC Protected Matters search (**Appendix C**) as potentially occurring within or using habitat in the operational area and MEZ. Species that occur in the MEZ may be affected by marine pollution in the event of a worst case unplanned hydrocarbon release); however, species that occur in the operational area have the potential to be impacted by planned (e.g. noise emissions) and unplanned (e.g. vessel strike) events.

Biologically Important Areas

Through the development of marine bioregional plans, BIAs have been identified for different species. BIAs are not defined under the EPBC Act, but they are areas that are particularly important for the conservation of protected species and where aggregations of individuals display biologically-important behaviour such as calving, foraging, resting or migration. BIAs have been identified using expert scientific knowledge about species' distribution abundance and behaviour (DoE, 2015a). BIAs were created to inform decision making under the EPBC Act, and have been identified for a selection of protected species only. These selected species were chosen based on their conservation status and the availability of reliable spatial and scientific information.

The following BIAs overlap spatially with the operational area:

- Pygmy blue whale distribution (**Figure 4-8**); and
- Whale shark foraging northward from Ningaloo along the 200 m isobath (July-November) (**Figure 4-10**).

Additional BIAs overlap the MEZ and EMBA (see **Table 4-4**).

Table 4-2 Threatened and/or migratory marine species potentially occurring within the operational area, MEZ and EMBA

Common Name	Species Name	EPBC Act Status		Presence		
		Threatened	Migratory	Operational Area	MEZ	EMBA
Marine Mammals						
Sei whale	*Balaenoptera borealis*	Vulnerable	Migratory	✓	✓	✓
Blue whale	*Balaenoptera musculus*	Endangered	Migratory	✓	✓	✓
Fin whale	*Balaenoptera physalus*	Vulnerable	Migratory	✓	✓	✓
Humpback whale	*Megaptera novaeangliae*	Vulnerable	Migratory	✓	✓	✓
Bryde's whale	*Balaenoptera edeni*	N/A	Migratory	✓	✓	✓
Killer whale	*Orcinus orca*	N/A	Migratory	✓	✓	✓
Sperm whale	*Physeter macrocephalus*	N/A	Migratory	✓	✓	✓
Spotted bottlenose dolphin (Arafura/Timor Sea)	*Tursiops aduncus*	N/A	Migratory	✓	✓	✓
Australasian humpback dolphin	*Sousa chinensis*	N/A	Migratory			✓
Dugong	*Dugong dugon*	N/A	Migratory			✓
Marine Reptiles						
Loggerhead turtle	*Caretta caretta*	Endangered	Migratory	✓	✓	✓
Green turtle	*Chelonia mydas*	Vulnerable	Migratory	✓	✓	✓
Leatherback turtle	*Dermochelys coriacea*	Endangered	Migratory	✓	✓	✓
Hawksbill turtle	*Eretmochelys imbricata*	Vulnerable	Migratory	✓	✓	✓
Flatback turtle	*Natator depressus*	Vulnerable	Migratory	✓	✓	✓
Short-nosed sea snake	*Aipysurus apraefrontalis*	Critically Endangered			✓	✓
Sharks, Rays and Fish						
Great white shark	*Carcharodon carcharias*	Vulnerable	Migratory	✓	✓	✓
Green sawfish	*Pristis zijsron*	Vulnerable	Migratory	✓	✓	✓
Whale shark	*Rhincodon typus*	Vulnerable	Migratory	✓	✓	✓
Narrow sawfish	*Anoxypristis cupidata*	N/A	Migratory	✓	✓	✓
Shortfin mako	*Isurus oxyrinchus*	N/A	Migratory	✓	✓	✓
Longfin mako	*Isurus paucus*	N/A	Migratory	✓	✓	✓
Grey nurse shark (west coast)	*Carcharias taurus*	Vulnerable			✓	✓
Reef manta ray	*Manta alfredi*	N/A	Migratory	✓	✓	✓
Giant manta ray	*Manta birostris*	N/A	Migratory	✓	✓	✓
Dwarf sawfish	*Pristis clavata*	Vulnerable	Migratory			✓

Common Name	Species Name	EPBC Act Status		Presence		
		Threatened	Migratory	Operational Area	MEZ	EMBA
Marine Birds						
Red knot	*Calidris canutus*	Endangered	Migratory	✓	✓	✓
Eastern curlew	*Numenius madagascariensis*	Critically Endangered	Migratory	✓	✓	✓
Common noddy	*Anous stolidus*	N/A	Migratory	✓	✓	✓
Streaked shearwater	*Calonectris leucomelas*	N/A	Migratory	✓	✓	✓
Lesser frigatebird	*Fregata ariel*	N/A	Migratory	✓	✓	✓
Great frigatebird	*Fregata minor*	N/A	Migratory	✓	✓	✓
Common sandpiper	*Actitis hypoleucos*	N/A	Migratory	✓	✓	✓
Sharp-tailed sandpiper	*Calidris acuminata*	N/A	Migratory	✓	✓	✓
Pectoral sandpiper	*Calidris melanotos*	N/A	Migratory	✓	✓	✓
Australian fairy tern	*Sternula nereis nereis*	Vulnerable			✓	✓
Osprey	*Pandion haliaetus*	N/A	Migratory		✓	✓
Curlew sandpiper	*Calidris ferruginea*	Critically Endangered				✓
Southern giant-petrel	*Macronectes giganteus*	Endangered	Migratory			✓

Table 4-3 Threatened species recovery plans, management plans and conservation advice relevant to the activity

Receptor	Recovery Plan, Management Plan or Conservation Advice	Threats/Strategies Identified as Relevant to the Activity	Relevant EP Section
All Vertebrate Fauna			
All vertebrate fauna	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (DoEE, 2018)	Marine debris	**Section 8.3**
Marine Mammals			
Sei whale	Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (TSSC, 2015a)	Anthropogenic noise and acoustic disturbance	**Section 7.4**
		Habitat degradation including pollution (increasing port expansion and coastal development)	**Sections 7.6, 8.1, 8.2**
		Pollution (persistent toxic pollutants)	**Sections 8.1, 8.2**
		Vessel strike	**Section 8.4**
Blue whale	Blue Whale Conservation Management Plan 2015 - 2025 (DoE, 2015a)	Noise interference	**Section 7.4**
		Habitat modification	**Section 8.1**
		Vessel disturbance	**Section 8.4**
Fin whale	Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (TSSC, 2015b)	Anthropogenic noise and acoustic disturbance	**Section 7.4**
		Habitat degradation including pollution (increasing port expansion and coastal development)	**Sections 7.6, 8.1, 8.2**
		Pollution (persistent toxic pollutants)	**Sections 8.1, 8.2**
		Vessel strike	**Section 8.4**
Humpback whale	Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) (TSSC, 2015c)	Noise interference	**Section 7.4**
		Vessel strike	**Section 8.4**
		Habitat degradation including coastal development and port expansion	**Section 8.1**
Marine Reptiles			
All Marine Turtles	National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020)	Light pollution	**Section 7.3**
Loggerhead turtle Green turtle Leatherback turtle Hawksbill turtle Flatback turtle	Recovery Plan for Marine Turtles in Australia 2017 – 2027 (DoEE, 2017a)	Deteriorating water quality	**Sections 7.6, 8.1, 8.2**
		Marine debris	**Section 8.3**
		Loss of habitat	**Sections 7.2, 8.1**
		Vessel disturbance	**Section 8.4**
		Light pollution	**Section 7.3**
Short-nosed seasnake	Approved Conservation Advice for *Aipysurus apraefrontalis* (Short-	Deteriorating water quality	**Sections 7.6, 8.1, 8.2**

Receptor	Recovery Plan, Management Plan or Conservation Advice	Threats/Strategies Identified as Relevant to the Activity	Relevant EP Section
	nosed Sea Snake) (DSEWPaC, 2011a)	Marine debris	**Section 8.3**
		Loss of habitat	**Sections 7.2, 8.1**
		Vessel disturbance	**Section 8.4**
Sharks, Rays and Fish			
White shark	Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC, 2013)	Ecosystem effects as a result of habitat modification and climate change	**Sections 7.2, 8.1**
Green sawfish	Commonwealth Conservation Advice on *Pristis zijsron* (green sawfish) (DEWHA, 2008b) Sawfish and River Sharks Multispecies Recovery Plan (DoE, 2015b)	Habitat degradation and modification	**Sections 7.2, 8.1**
Whale shark	Approved Conservation Advice for *Rhincodon typus* (whale shark) (TSSC, 2015d)	Vessel strike	**Section 8.4**
		Habitat disruption from mineral exploration, production and transportation	**Sections 7.4, 8.1**
Grey nurse shark	Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (DoE, 2014)	Pollution and disease	**Sections 8.1, 8.2**
		Ecosystem effects - habitat modification and climate change	**Sections 7.2, 8.1**
Marine Birds			
All Seabirds and Shorebirds	National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020)	Light pollution	**Section 7.3**
Red knot	Approved Conservation Advice *Calidris canutus* (Red Knot) (TSSC, 2016)	Habitat loss, disturbance and modifications	**Section 8.1**
		Direct mortality (bird strike)	**Section 8.4**
Eastern curlew	Approved Conservation Advice for *Numenius madagascariensis* (Eastern Curlew) (DoE, 2015c)	Habitat loss and degradation from pollution	**Section 8.1**
Australian fairy tern	Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern) (DSEWPaC, 2011b)	Habitat loss, disturbance and modifications	**Section 8.1**

Table 4-4 Biologically important areas in the operational area, MEZ and EMBA

Species	BIA Area	Presence in		
		Operational Area	MEZ	EMBA
Marine Mammals				
Pygmy blue whale	Distribution	✓	✓	✓
	Migration		✓	✓
Humpback whale	Migration (north and south)			✓
Marine Reptiles				
Flatback turtle	Internesting buffer		✓	✓
	Internesting buffer incl. critical habitat			✓
Green turtle	Internesting buffer (incl. critical habitat)			✓
Hawksbill turtle	Internesting buffer (incl. critical habitat)			✓
Sharks, Rays and Fish				
Whale shark	Foraging	✓	✓	✓
Marine Birds				
Wedge-tailed shearwater	Breeding		✓	✓

4.4.1.2 World and National Heritage Properties

No World or National Heritage Properties occur within the operational area, MEZ or EMBA (**Appendix C**).

4.4.1.3 Wetlands of International Importance (Ramsar)

No Wetlands of International Importance occur within the operational area, MEZ or EMBA (**Appendix C**).

4.4.1.4 Threatened Ecological Communities

No listed Threatened Ecological Communities occur within the operational area, MEZ or EMBA (**Appendix C**).

4.4.2 Other Matters Protected Under the EPBC Act

4.4.2.1 Commonwealth Heritage Places

No Commonwealth Heritage Places overlap the operational area, MEZ or EMBA (**Appendix C**).

4.4.2.2 Wetlands of National Importance

No Nationally Important Wetlands overlap the operational area, MEZ or EMBA (**Appendix C**).

4.4.2.3 Australian Marine Parks

Australian Marine Parks (AMPs) (Commonwealth reserves proclaimed under the EPBC Act in 2007 and 2013) are located in Commonwealth waters that start at the outer edge of state and territory waters, generally three nautical miles (approximately 5.5 km) from the shore, and extend to the outer boundary of Australia's exclusive economic zone (EEZ), 200 nautical miles (approximately 370 km) from the shore (DNP, 2018).

No AMPs overlap the operational area or MEZ (**Appendix C**). One AMP overlaps the EMBA, namely the Montebello Marine Park.

4.4.3 State Marine Parks, Reserves and Management Areas

The operational area, MEZ and EMBA do not overlap any State marine parks, reserves or management areas.

4.4.4 Key Ecological Features

Key Ecological Features (KEFs) are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. No KEFs overlap the operational area, but three KEFs occur within the MEZ and EMBA (**Table 4-5**; **Figure 4-3**).

Table 4-5 Key Ecological Features in the MEZ

Key Ecological Feature	Location, Values and National/Regional Importance
Ancient Coastline at 125 m Depth Contour	• The ancient coastline at 125 m depth contour KEF is ~2.6 km south of the operational area, at its closest point. • It is defined as a KEF because of its unique seafloor feature with ecological properties of regional significance. The spatial boundary of this KEF is defined by depth range of 115–135 m in the Northwest Shelf Province and Northwest Shelf Transition IMCRA provincial bioregions (DAWE, 2020a). • The ancient submerged coastline provides areas of hard substrate and therefore may provide sites for higher diversity and enhanced species richness relative to surrounding areas of predominantly soft sediment. Little is known about fauna associated with the hard substrate of the escarpment but it is likely to include sponges, corals, crinoids, molluscs, echinoderms and other benthic invertebrates representative of hard substrate fauna in the Northwest Shelf (NWS) bioregion (DAWE, 2020a). • The escarpment may also facilitate increased availability of nutrients off the Pilbara by interacting with internal waves and enhancing vertical mixing of water layers. Enhanced productivity associated with the sessile communities and increased nutrient availability may attract larger marine life such as whale sharks and large pelagic fish (DAWE, 2020a).
Continental Slope Demersal Fish Communities	• The continental slope demersal fish communities KEF is located ~96 km to the southwest of the operational area. • This species assemblage is recognised as a KEF because of its biodiversity values, including high levels of endemism. The spatial boundary of this KEF is defined as the area of slope in the Northwest Province and Timor Province provincial bioregions, at the depth ranges of 220-500 m and 750-1,000 m (DAWE, 2020a). • The diversity of demersal fish assemblages on the continental slope in the Timor Province, the Northwest Transition and the Northwest Province is high compared to elsewhere along the Australian continental slope. The continental slope between North West Cape and the Montebello Trough has >500 fish species, 76 of which are endemic, which makes it the most diverse slope bioregion in Australia (Last et al. 2005). The slope of the Timor Province and the Northwest Transition also contains >500 species of demersal fish of which 64 are considered endemic (Last et al. 2005). The Timor Province and Northwest Transition bioregions are the second-richest areas for demersal fish across the entire continental slope (DAWE, 2020a). • Demersal fish species occupy two distinct demersal community types (biomes) associated with the upper slope (water depth of 225–500 m) and the mid-slope (750–1000 m). Higher-order consumers may include carnivorous fish, deep-water sharks, large squid and toothed whales (Brewer et al. 2007). Pelagic production is phytoplankton based, with hot spots around oceanic reefs and islands (Brewer et al. 2007).

Key Ecological Feature	Location, Values and National/Regional Importance
Glomar Shoals	• The Glomar Shoals are ~31 km southeast of the operational area. • The Glomar Shoals are defined as a KEF for their high productivity and aggregations of marine life. They are a submerged littoral feature located approximately 150 km north of Dampier on the Rowley shelf at depths of 33–77 m (Falkner et al. 2009). • The shoals consist of a high percentage of marine-derived sediments with high carbonate content and gravels of weathered coralline algae and shells (McLoughlin and Young, 1985). The area's higher concentrations of coarse material in comparison to surrounding areas are indicative of a high-energy environment subject to strong sea-floor currents (Falkner et al. 2009). While the biodiversity associated with the Glomar Shoals has not been studied, the shoals are known to be an important area for a number of commercial and recreational fish species such as rankin cod, brown striped snapper, red emperor, crimson snapper, bream and yellow-spotted triggerfish (Falkner et al. 2009; Fletcher and Santoro, 2009). High catch rates of these species have been recorded in association with the Glomar Shoals, indicating that the shoals are likely to be an area of high productivity.

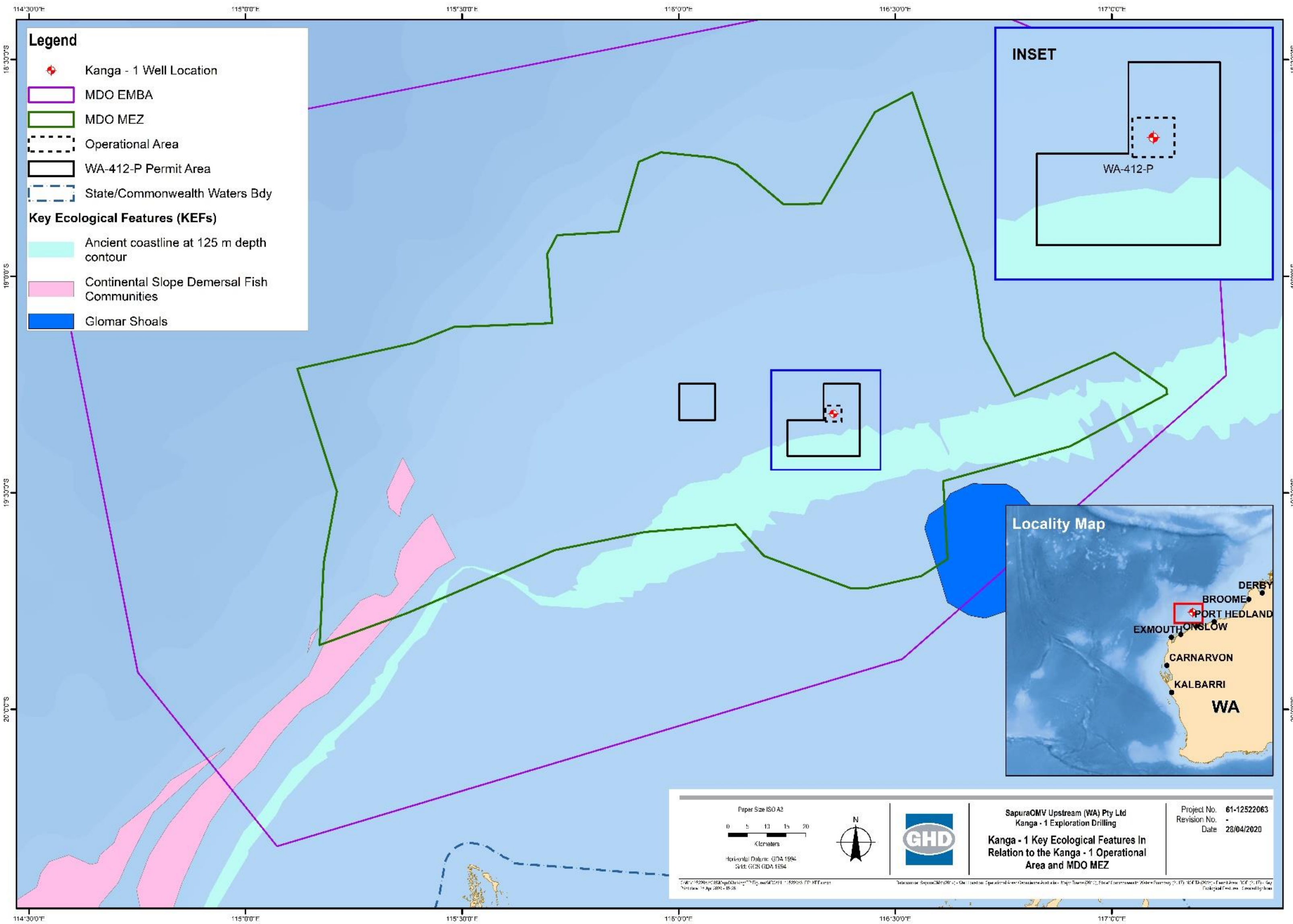


Figure 4-3 Key ecological features in the vicinity of the operational area and MEZ

4.5 Physical Environment

4.5.1 Climate and Meteorology

4.5.1.1 Air Temperature

Air temperatures recorded at the Karratha aerodrome, the closest Bureau of Meteorology (BoM) climatological station to WA-412-P, follow seasonal trends (**Figure 4-4**) with a mean maximum air temperature peaking at 36.2 °C and a mean minimum temperature of 13.8 °C (BoM, 2020a).

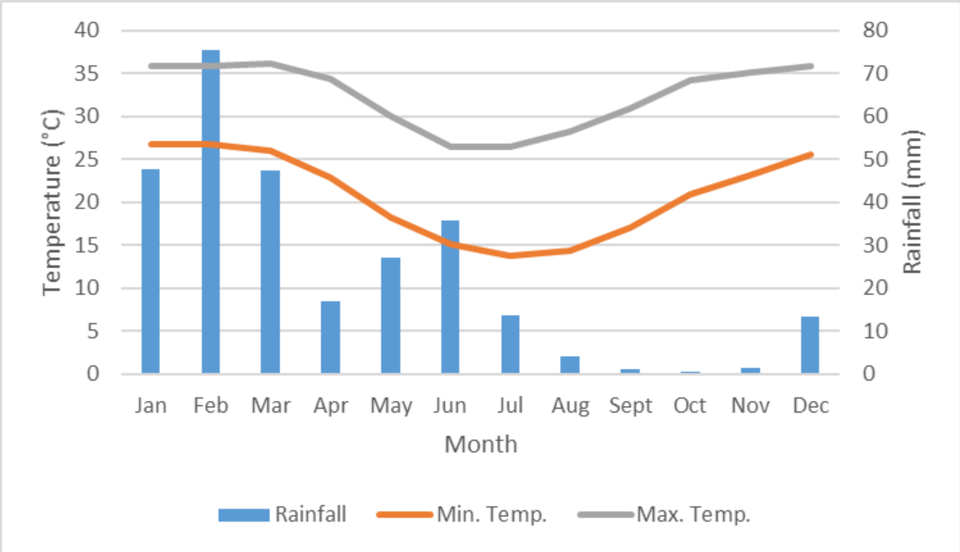


Figure 4-4 Mean monthly rainfall and minimum/maximum temperatures at Karratha aerodrome (BoM, 2020a)

4.5.1.2 Winds

The summer and winter seasons fall into the periods September–March and May–July, respectively. Winds typically vary seasonally, with a tendency for winds to come from south-westerly during summer months and south-easterly in winter (**Figure 4-5**) (Condie et al. 2006). Transitional wind periods, during which either pattern may predominate, can be experienced in April–May and September of each year. Summer winds are more variable, and driven by high pressure cells that pass from west to east over the Australian continent. During winter months the relative position of the high pressure cells moves further north, leading to prevailing easterly winds blowing from the mainland (Pearce et al. 2003).

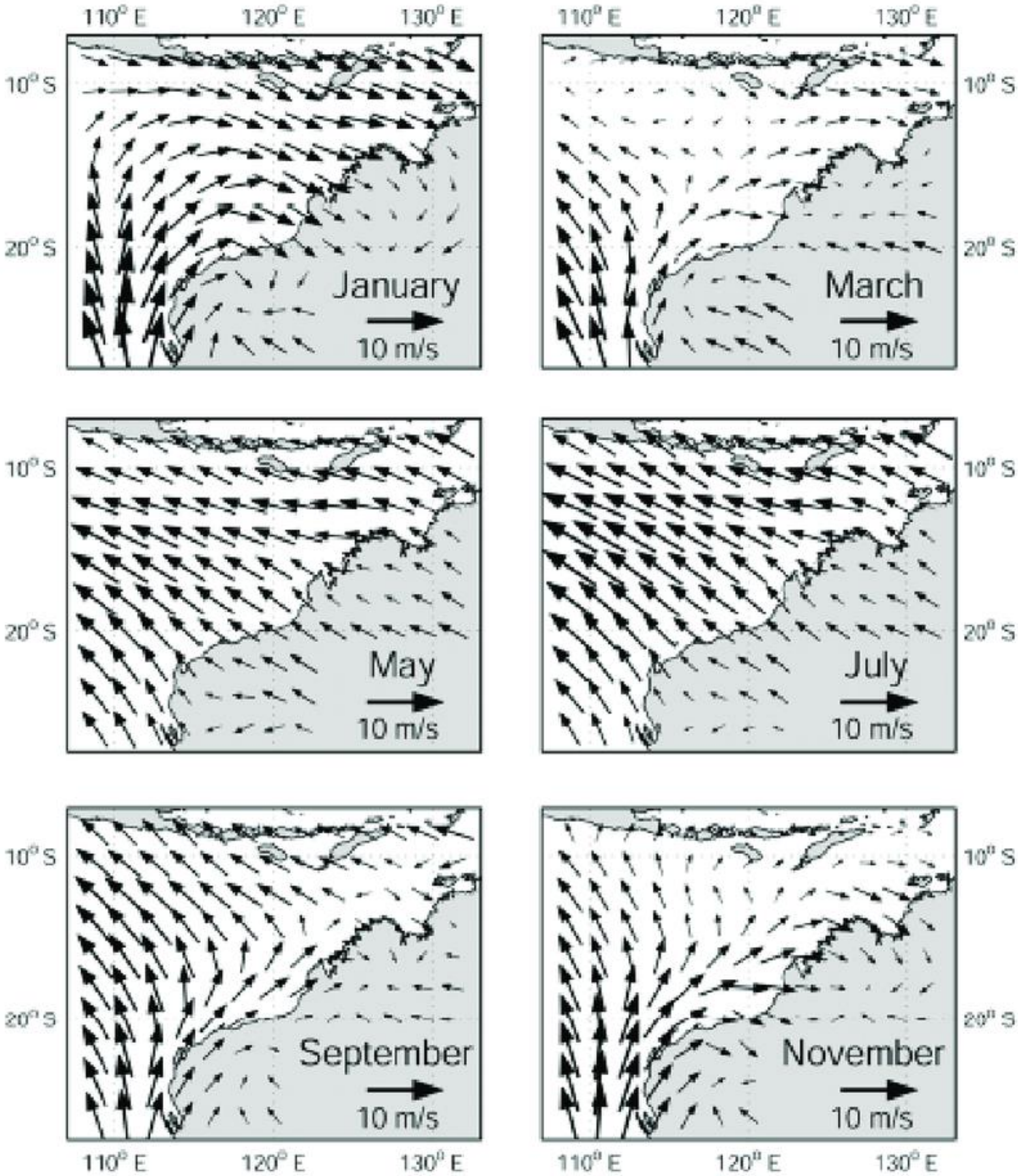


Figure 4-5 Seasonally averaged winds in northwest Australia (Condie et al. 2006)

4.5.1.3 Tropical Cyclones

Tropical cyclones are low pressure systems that form over warm tropical waters and have well defined wind circulations of at least gale force strength (sustained winds of 63 km/h or greater with gusts in excess of 90 km/h) (BoM, 2020b). The Australian cyclone season officially runs from November to April, although very few have occurred in November. Tropical cyclones in the Australian region are influenced by several factors, and in particular variations in the El Niño – Southern Oscillation. In general, more tropical cyclones cross the coast during La Niña years, and fewer during El Niño years. On average about eleven cyclones form in the Australian region (90-160° E) each cyclone season (BoM, 2020b).

Figure 4-6 shows the average number of tropical cyclones throughout the Australasian region and surrounding waters. The data are based on a 48-year period from the 1969/70 to 2017/18 tropical cyclone season.

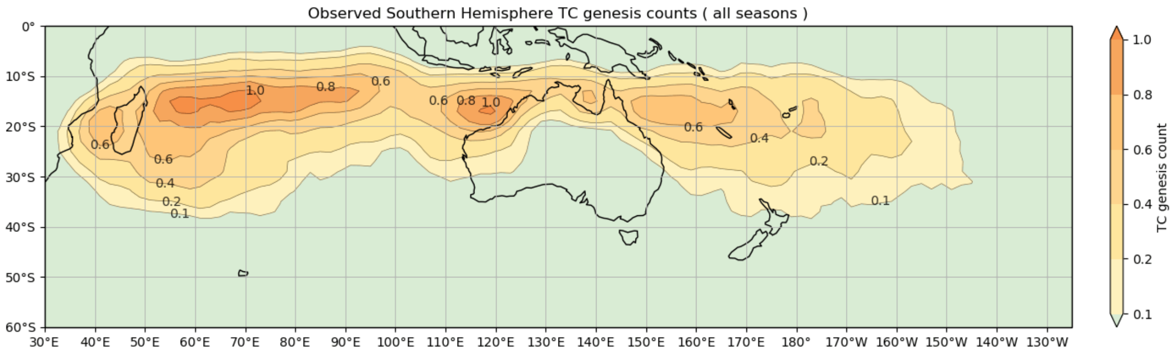


Figure 4-6 Average number of tropical cyclones in Australia from 1969 to 2018 (BoM, 2020b)

4.5.1.4 Rainfall

The region has a pronounced monsoon season between December and March, which brings with it heavy rainfall. Historical rainfall data shows the highest mean monthly rainfall occurs from January to March (**Figure 4-4**) (BoM, 2020a).

4.5.1.5 Air Quality

The operational area is offshore and remote from urbanisation. Therefore, local air quality is expected to be relatively high. Only localised and temporary reductions in air quality are expected, in association with anthropogenic sources such as emissions generate by shipping and oil and gas activities.

4.5.2 Oceanography

The NWS bioregion is a dynamic oceanographic environment, influenced by strong tides, cyclonic storms, long-period swells and internal tides (DEWHA, 2008a).

4.5.2.1 Currents

The NWMR is influenced by a complex system of ocean currents that change between seasons and between years, which generally result in its surface waters being warm and nutrient-poor, and of low salinity (DEWHA, 2008a). Two ocean and coastal currents in the WA region are significant in shaping marine environmental conditions and climate. Forming on the NWS, the Leeuwin Current exerts a major influence on the distribution of marine life and WA's weather. The Indonesian Throughflow is a system of currents that carries water westward from the Pacific to the Indian Ocean through the deep passages and straits of the Indonesian Archipelago. This is the only place in the world where warm, equatorial waters flow from one ocean to another, and this warm tropical water influences the character of the Leeuwin Current (CSIRO, 2020). **Figure 4-7** represents key patterns of ocean currents around Australia.

Currents within the shallow nearshore waters are primarily driven by the prevailing wind regime, resulting in almost exclusively northward flow between October and February, as a result of the dominant southerly winds prevailing during the summer months, and dominantly southward in winter (DEWHA, 2008a).

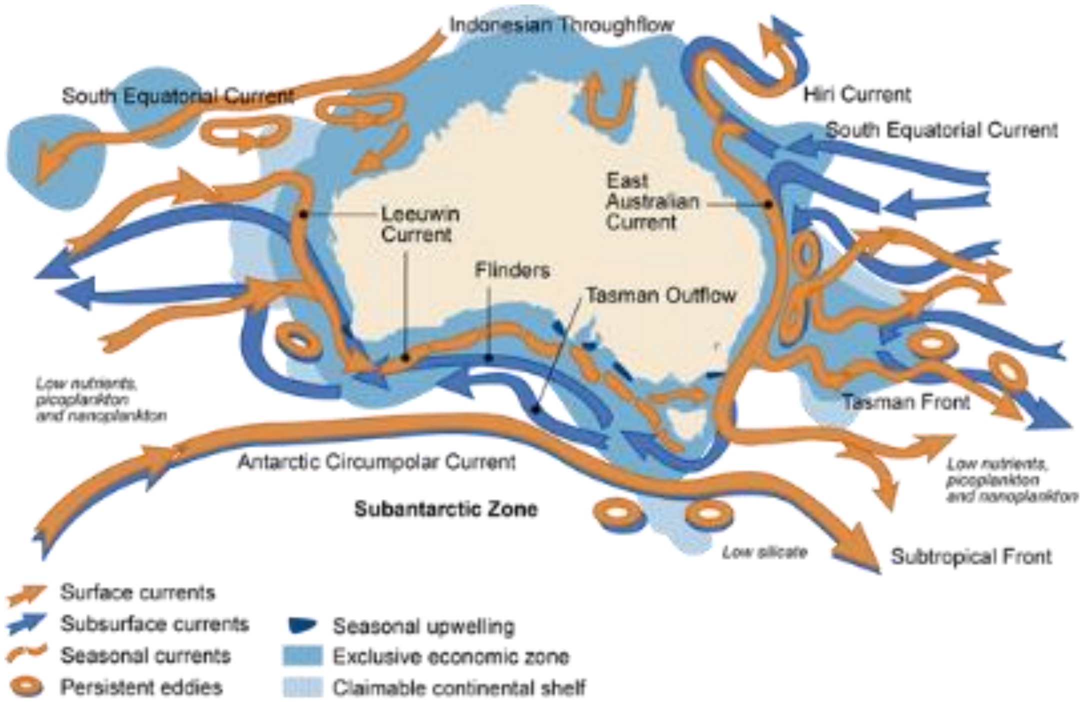


Figure 4-7 Ocean currents surrounding Australia (CoA, 2013)

4.5.2.2 Tides and Waves

The tides of the region are mixed and predominantly semi-diurnal (two high tides and two low tides per day), with well-developed spring to neap tidal variation (DEWHA, 2008a). The NWMR has some of the largest tides in Australia, with an increase in amplitude from south to north, which corresponds with the increasing width of the shelf (Holloway, 1983). Tides and winds strongly influence water flow in the coastal zone and over the inner to mid-shelf, whereas flows over the outer-shelf, slope, rise and deeper waters are influenced by large scale regional circulation (DEWHA, 2008a).

Perhaps one of the most unique features of the NWMR is the occurrence of internal waves. Internal waves are dynamic, episodic events, which are strongly influenced by topography and generated by internal tides (DEWHA, 2008a). Internal tides occur at the thermocline, where the warm, low salinity waters of the Indonesian Throughflow overlay colder and more saline, deeper ocean waters. Internal tides are large in scale, frequently occurring across an ocean basin and forced by the gravitational pull of the moon and sun (DEWHA, 2008a).

Waves within the NWMR reflect the direction of the synoptic winds. They flow predominantly from the southwest in the summer and from the east in winter (Pearce et al. 2003). Only 10% of significant wave heights off Dampier exceed 1.2 m, with the average wave height being 0.7 m (Pearce et al. 2003).

4.5.3 Water Quality

The NWMR is an oligotrophic environment (Holloway et al. 1985). Nutrient enrichment of the shelf occurs through river runoff, tidal mixing, internal tides, low frequency circulation, upwelling, and tropical cyclones that induce oceanic mixing and further upwelling (Holloway et al. 1985). The Leeuwin current maintains warm sea surface temperatures that inhibit the establishment of macrophyte communities that compete with reef building organisms (Hatcher, 1991) and contribute to the transportation of reef larvae and propagules down the west coast of Australia.

4.5.4 Bathymetry and Geomorphology

The NWMR is divided into four physiographic regions: the inner shelf; middle shelf; outer shelf/slope; and abyssal plain/deep ocean floor. These divisions are made on the basis of water depth and the geomorphic provinces. The Kanga -1 operational area lies in the middle shelf, which is defined as the region between 30 and 200 m water depths (Baker et al. 2008). The middle shelf environment covers the majority of shelf within the NWMR. Prominent geomorphic features of the region include terraces, deeps/holes/valleys, ridges, plateaus and pinnacles. In their most general sense, raised geomorphic features such as banks and ridges are more likely to support richer and more abundant epifaunal assemblages (Przeslawski et al. 2011). However, available data indicates that the seabed of the Rowley/Northwest Shelf, where the operational area is located, is gentle and smooth (Baker et al. 2008) and more likely dominated by infauna and detritivores (Przeslawski et al. 2011).

The MEZ is located in water depths ranging from ~100 m to >1000 m.

4.5.5 Sedimentology

Seabed sediments of the NWMR comprise bio-clastic, calcareous and organogenic sediments that were deposited by relatively slow and uniform sedimentation rates. Seabed sediments of the middle shelf, where the operational area is located, are dominated by sand with accumulations of coral and gravel deposits (Baker et al. 2008). According to the CAMRIS Marine Benthic Substrate Database – Marsed (Lucieer et al. 2017) the benthic substrate within the operational area is primarily made up of mud and calcareous clay, with the southeast corner made up of calcareous gravel, sand and silt. The benthic substrate of the MEZ is the same, but with areas further offshore made up of calcareous ooze (Lucieer et al. 2017).

Major contributors to sediment mobilisation in the NWMR include storm events (including tropical cyclones), internal tides and ocean currents (including the Leeuwin current) (Baker et al. 2008). Sediments of the middle shelf region are predominantly influenced by tidal processes, including internal tides (Baker et al. 2008).

4.6 Biological Environment

4.6.1 Benthic Habitat and Communities

As the operational area is dominated by soft sediment; soft sediment benthic fauna may include animals living within the sediments (infauna) and those living on or above the seabed (sessile and mobile epifauna). This fauna comprises predominantly mobile burrowing species including molluscs, crustaceans (crabs, shrimps and smaller related species), polychaetes, sipunculid and platyhelminth worms, asteroids (sea stars), echinoids (sea urchins) and other small animals. Given the water depth within the operational area is ~147 m, benthic primary producer's habitat (e.g., seagrass, macroalgae and hard corals) is unlikely to be present due to insufficient light availability.

The soft-bottom environment of the MEZ is likely to support sparsely distributed epibenthic communities and mobile benthic species, such as sea cucumbers, ophiuroids, echinoderms, polychaetes and sea pens (DEWHA, 2008a). Gage (1996) reported that the density of benthic fauna tends to be lower in deep water sediments (>200 m) than in shallower coastal sediments, but the diversity of communities may be similar.

4.6.2 Plankton

Plankton communities comprise phytoplankton and zooplankton, including fish eggs and larvae. Phytoplankton and zooplankton are a source of primary and secondary productivity, and key food sources for other organisms in the oceans (Brewer et al. 2007). Plankton is widespread throughout oceanic environments and is expected to occur in the operational area and MEZ.

Plankton abundance and distribution is patchy, dynamic and strongly linked to localised and seasonal productivity (Evans et al. 2016). Biological productivity in the NWMR follows boom and bust cycles, is sporadic and significantly geographically dispersed (DEWHA, 2008a). The spatial distribution and seasonal cycles of biological productivity in the NWS are poorly understood, but higher productivity is likely to be associated with topographic features such as escarpments along the ancient coastline and the Glomar Shoals (DEWHA, 2008a). In MEZ waters further offshore, productivity is generally low and the dominant primary consumers are pelagic, vertically migrating zooplankton (DEWHA, 2008a).

4.6.3 Marine Mammals

Four threatened and migratory and four migratory marine mammal species were identified by a search of the EPBC Act Protected Matters Database as potentially occurring in the operational area and MEZ (**Table 4-2**). An additional two migratory species may occur in the EMBA (**Table 4-2)**.

A description of these marine mammals is provided in **Table 4-6**, including their distribution, migratory movements, preferred habitat and likely presence within the operational area and MEZ.

Table 4-6 Threatened and migratory marine mammals

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Sei Whale *Balaenoptera borealis*	Vulnerable, Migratory	• The sei whale has a worldwide oceanic distribution, and can be found in predominantly deep waters or near continental slopes of temperate to subpolar waters (Prieto et al. 2014). The species is expected to seasonally migrate between low latitude wintering areas and high latitude summer feeding grounds (Bannister et al. 1996; Prieto et al. 2012). • In Australia, migratory routes are between Australian waters and Antarctic feeding areas, but movements are unpredictable and not well documented. • Sei whales have been infrequently recorded in Australia, and very rarely seen in inshore waters, with the exclusion of the Bonney Upwelling (Bannister et al. 1996). There are no known mating or calving areas in Australian waters (Bannister et al. 1996; Parker, 1978).	Given the wide ranging nature of this species, lack of nearby important habitat and a preference for deeper offshore waters, the presence of the species within the operational area and MEZ is likely to be limited.
Blue Whale *Balaenoptera musculus*	Endangered, Migratory	• There are two recognised subspecies of blue whale in the southern hemisphere that are both recorded in Australian waters, the southern (or 'true') blue whale (*Balaenoptera musculus intermedia*) and the 'pygmy' blue whale (*Balaenoptera musculus brevicauda*). In general, southern blue whales occur in waters south of 60° S and pygmy blue whale occur in waters north of 55° S (i.e. not in the Antarctic). By this definition, any blue whales present in the operational area and MEZ would be expected to be pygmy blue whales. • Pygmy blue whale migration is thought to follow deep oceanic routes (DEWHA, 2008a). More recently, the migration route has been defined as along the shelf edge at depths between 500 m to 1,000 m (DoE, 2015a), where they are likely to feed opportunistically on ephemeral krill aggregations (DEWHA, 2008a). Satellite tagging established that the general distribution of pygmy blue whales was offshore in water depths >200 m and commonly >1,000 m	The operational area is outside the migration BIA for pygmy blue whales and although it overlaps with the distribution BIA, the water depths in the area make it unlikely that significant numbers of this species would be present during the activity. The MEZ overlaps the migration BIA (**Figure 4-8**), where individuals tend to pass along the shelf edge at depths of 500 m to 1,000 m, although they do appear closer to the coast during the southern part of the migration (DAWE,

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
		(Double et al. 2012). This data was revisited in 2014 and showed that whales travelled relatively near to the Australian coastline (~100 km) until reaching North West Cape, after which they travelled offshore (~240 km). Once away from the Australian coast, the water depths of recorded pygmy blue whale presence exceeded 4,000 m (Double et al. 2014). • More recent acoustic and satellite tracking surveys at various locations along the WA coast have further delineated pygmy blue whale migration from McCauley and Jenner (2010) as an annual north-bound migration past Exmouth and the Montebello Islands between April and August (peak period between May and June), and southbound migration from October to the end of January, peaking in late November to early December (Double et al. 2014). • Pygmy blue whales prefer to travel alone or in small groups (McCauley, 2011; Gilmour et al. 2013).	2020b). Occurrence in the MEZ will be restricted to individuals transiting the area, with a higher likelihood of occurrence during April– August and October–January, during their seasonal migrations.
Fin Whale *Balaenoptera physalus*	Vulnerable, Migratory	• Fin whales are the second largest baleen whale species, and inhabit polar to tropical waters globally. Like other baleen whales, fin whales migrate annually between high latitude summer feeding grounds and lower latitude over-wintering areas (Bannister et al. 1996). • Areas of upwelling and interfaces between mixed and stratified waters may be an important feature of fin whale feeding habitat. In the Antarctic the species is seen feeding both at the ice edge and further to the north in areas of complex bathymetry (DEH, 2005a). • There is insufficient data to define migration times for fin whales, but recent sightings in Australian waters include summer and autumn months (DAWE, 2020a). It is likely that fin whales pass through Australian waters between calving grounds in Indonesia and feeding grounds in the subantarctic and Antarctic (DAWE, 2020a). • In Australia, there are confirmed records of fin whales for all coastal waters except in New South Wales (NSW) and the Northern Territory, but the available information suggests that the species is more commonly present in deeper water (DEH, 2005a).	Given the wide ranging nature of this species, lack of nearby important habitat and a preference for deeper offshore waters, the presence of the species within the operational area and MEZ is likely to be limited.
Humpback Whale *Megaptera novaeangliae*	Vulnerable, Migratory	• Humpback whales have a worldwide distribution, migrating along coastal waters from polar feeding grounds to subtropical breeding grounds. There are two genetically distinct populations of humpback whales in Australia (west coast and east coast) (DAWE, 2020a). • The largest population of humpback whales worldwide, the Breeding Stock D population (estimated at ~20,000–30,000) (Salgado Kent et al. 2012), feeds in Antarctic Management Area IV (70°E–130°E) and there is evidence that these are the animals that migrate along the west coast of Australia (Franklin et al. 2017). • The humpback whale annual migration from the summer feeding grounds in Antarctica to the breeding and calving grounds in Camden Sound occurs between May and October (Jenner et al. 2001; Thums et al. 2018). Peak migration times from Port Hedland to Broome are between July and October (DMP, 2013).	Given, the absence of known migratory, foraging, resting and calving habitat, presence within the operational area and MEZ is likely to be infrequent and consist of transitory individuals during migration months.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
		• The west coast population is thought to be increasing at a rate of 10%–13% each year (Bannister and Hedley, 2001, Salgado Kent et al., 2012). • The humpback whale migration (north and south) BIA does not overlap the operational area or MEZ, and is located ~62 km to the south-southeast of the operational area (**Figure 4-8**).	
Bryde's Whale *Balaenoptera edeni*	Migratory	• Bryde's whales are the second smallest of the baleen whales. Two provisional subspecies were recently recognized, *B.edeni edeni* and *B.edeni brydei*, referring to the small, coastal form (limited to the 200 m depth isobar) and larger, oceanic form (500 m to 1,000 m) respectively (Kershaw et al. 2013; Rosel and Wilcox, 2014). • Bryde's whales are found in the Atlantic, Pacific, and Indian Oceans in warm temperate and sub-tropical waters. Populations are bounded by latitudes 40° N and 40° S and the 20°C isotherm (Bannister et al. 1996), and they have been recorded from all Australian states except the Northern Territory (Bannister et al. 1996). • Bryde's whales do not undertake the long-range seasonal migrations typically associated with most other baleen whales, but they may travel widely throughout ocean basins as they move through tropical and warm-temperate waters (Kato and Perrin, 2018). • The area of occupancy cannot be calculated due to the paucity of confirmed records for pelagic waters off Australia. • Bryde's whales feed almost exclusively on pelagic fish (pilchard, mackerel, herring, and anchovies), pelagic crustaceans (shrimp, crabs, and lobsters), and cephalopods (octopus, squid, and cuttlefish).	Given the wide ranging nature of this species and lack of nearby important habitat, the presence of the species within the operational area and MEZ is likely to be limited.
Orca / Killer Whale *Orcinus orca*	Migratory	• The killer whale is a cosmopolitan marine mammal found in all oceans of the world, from shallow coastal waters to deep offshore waters (Ford, 2002). • In Australia, killer whales have been sighted in all state and territory waters. Higher concentrations have been reported off southern Australia, from southern NSW to western Victoria (Mustoe, 2008), and off WA, from the far southeast to mid-north coast (Wellard et al. 2015; Pitman et al. 2015). • Killer whales off WA have been observed preying on neonatal humpback whales during the humpback whale northern migration to calving grounds (Pitman et al. 2015; V. Brosig pers. comm.). Nonetheless, there is limited knowledge of their distribution, movements, habitat use and population status. To date, there has been no reliable estimate of the population size of killer whales in Australian waters. • To date, no areas of significance and no migration routes have been identified for this species within waters off WA (DAWE, 2020a). • The presence of killer whales is likely to be a rare occurrence and limited to a few individuals infrequently transiting the operational area.	Given the wide ranging nature of this species, lack of nearby important habitat and a preference for coastal waters, the presence of the species within the operational area is unlikely. Presence within the MEZ is also likely to be limited.
Sperm Whale *Physeter macrocephalus*	Migratory	• Sperm whales are the largest of the toothed whales and are distributed worldwide in deep waters (greater than 200 m) off continental shelves and sometimes near shelf edges (Bannister et al. 1996). They are	Given the wide ranging nature of this species, lack of nearby important habitat and a preference

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
		most common in submarine canyons at the edges of the continental shelf, but they also occur in mid-ocean. • Sperm whales have been recorded in all Australian state waters; female and juvenile sperm whales may not undergo extensive latitudinal migrations, but older, larger male sperm whales are generally found near the edge of the Antarctic pack-ice, occasionally returning to the warm water breeding area (DAWE, 2020a). • Off the WA coast, where the continental shelf slopes less steeply, sperm whales appear to be less concentrated close to shelf edge and more widely dispersed offshore (Bannister et al. 1996). In WA, one key locality includes the area between Cape Leeuwin and Esperance, close to the edge of the continental shelf (averaging 20–30 nm offshore). • Two foraging BIAs for sperm whales have been identified; located at the western end of Perth canyon and at Albany canyons (DAWE, 2020b).	for deep waters, the presence of the species within the operational area is unlikely. Presence within the MEZ is also likely to be limited.
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) *Tursiops aduncus*	Migratory	• The Indian Ocean bottlenose dolphin (*Tursiops aduncus*), also referred to as the spotted bottlenose dolphin, mainly occurs in four regions around Australia: Eastern Indian Ocean, Tasman Sea, Coral Sea and Arafura/Timor seas (DAWE, 2020a). Only the Arafura/Timor Sea populations are considered Migratory. • The species tends to occur in inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters including coastal areas around oceanic islands (DAWE, 2020a). • The closest calving BIA is located at Roebuck Bay, ~619 km from the operational area. They are thought to be residents that use this area year-round, but some proportion are also likely to be transient (DAWE, 2020b). Calving peaks occur in spring and summer or spring and autumn (DSEWPaC, 2012a).	Given the species preference for shallow water and close proximity to shore, the presence of the species within the operational area and MEZ is likely to be limited.

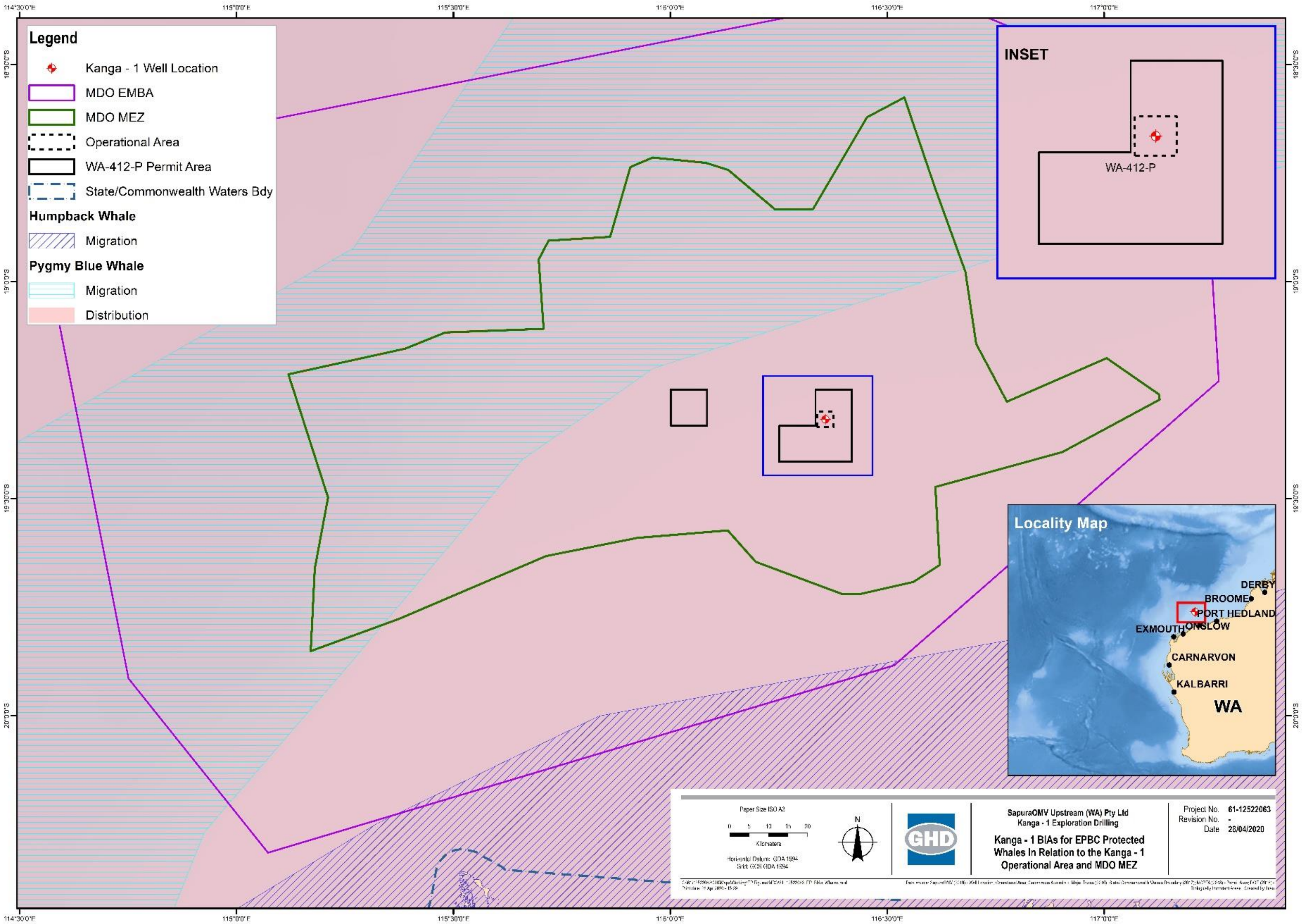


Figure 4-8 BIAs for whale species within the vicinity of the operational area and MEZ

4.6.4 Marine Reptiles

4.6.4.1 Marine Turtles

Marine turtles have similar life cycle characteristics, which include migration from foraging areas to mating and nesting areas. All species with the exception of flatback turtles have an oceanic pelagic stage before moving to nearshore waters to breed. Six species of marine turtle occur in, use the waters, and nest on sandy beaches in WA. All are listed as threatened and migratory. Of these, five were identified in the EPBC Act Protected Matters Database search as having the potential to occur in the operational area, MEZ and EMBA (**Table 4-2**). A description of their distribution, migratory movements, preferred habitat and likely presence within the operational area and MEZ is provided in **Table 4-7**.

There are several BIAs for turtle species in the region, including along the coastline and offshore islands. No BIAs overlap the operational area, with the closest being an internesting buffer for flatback turtles (Dampier Archipelago), at ~46 km to the south-southeast. One flatback turtle internesting buffer BIA (Montebello Islands) overlaps the MEZ. Several additional buffers overlap the EMBA. (**Table 4-4**; **Figure 4-9**).

More recently, “habitat critical to the survival of marine turtle species” was identified in the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a). No habitat critical to the survival of a marine turtle species occurs within the operational area or MEZ. The operational area is ~62 km from the boundary of the ‘Habitat Critical’ for flatback turtles in Dampier Archipelago. The EMBA overlaps ‘Habitat Critical’ for flatback, green and hawksbill turtles (**Figure 4-9**).

4.6.4.2 Sea snakes

Sea snakes are essentially tropical in distribution, and habitats reflect influences of factors such as water depth, nature of seabed, turbidity and season (Heatwole and Cogger, 1993). Some species have extensive distributions and individuals may cover large distances, while other species have limited home ranges (Heatwole and Cogger, 1993).

Sea snakes are a national conservation priority given their declining numbers around Australia, and in particular WA which once was a region of high sea snake abundance (Udyawer et al. 2016). All of Australia’s sea snakes are listed marine species under the EPBC Act. Of the three species endemic to NW Australia, two are Critically Endangered and one is Endangered (Udyawer et al. 2016). Of these, only one has the potential to occur in the operational area and MEZ (**Table 4-7**).

Pressures affecting sea snakes include fishing and trawling, habitat modification and climate change.

Table 4-7 Threatened and migratory marine reptiles

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Loggerhead Turtle *Caretta caretta*	Endangered, Migratory	• The loggerhead turtle has a global distribution throughout tropical, sub-tropical and temperate waters (Marquez, 1990). But, turtles are known to show fidelity to both their foraging and breeding areas (DAWE, 2020a). • The species is carnivorous and feeds predominantly on benthic invertebrates in habitats ranging from nearshore to 55 m depth (Limpus, 2009). • Nesting in WA is concentrated along the central coast. The closest known breeding/nesting beaches to the operational area are found at Rosemary Island, 125 km to the south and the Montebello Islands, 137 km to the southwest of the operational area. • Internesting habitat is located immediately seaward of designated nesting habitat of marine turtles. The internesting habitat buffer for loggerhead turtles is 20 km (DoEE, 2017a).	Due to the distance offshore of the operational area, loggerhead turtles are unlikely to be encountered. Transitory turtles may occur within the MEZ.
Green Turtle *Chelonia mydas*	Vulnerable, Migratory	• Green turtles are found in tropical and subtropical waters throughout the world (Marquez 1990; Bowen et al. 1992), with WA supporting one of the largest green turtle populations in the world. Green turtles nest, forage and migrate across tropical northern Australia (DAWE, 2020a). • The species feeds in intertidal and subtidal habitats such as seagrass meadows, coral and rocky reefs, algal turfs, and sand and mud flats; and feed on seagrass, sponges and algae (Limpus et al. 1992). • The closest known significant breeding/nesting grounds (BIAs) to the operational area are the Dampier Archipelago at ~125 km to the south-southeast, and the Montebello Islands at ~137 km to the southwest of the operational area (**Figure 4-9**). • Female green turtles go into an internesting cycle after each nesting occurrence. The internesting cycle takes approximately two weeks once nesting starts. The females spend this period in shallow waters beyond the reef edge, where they visit different substrates, occupy different depths and move from the nesting beach. During the internesting periods green turtles are known to remain within 10 km of nesting beaches (Waayers et al. 2011). • Satellite tracking studies have shown that green turtles migrate between breeding beaches and feeding grounds off the northwest coast (Pendoley, 2005).	Due to the water depths of the operational area, foraging habitat would be absent. Therefore, is unlikely that individuals will be encountered in the operational area. Individuals encountered in the operational area and MEZ will be of a transitory nature.
Leatherback Turtle *Dermochelys coriacea*	Endangered, Migratory	• The leatherback turtle has the widest distribution of any marine turtle, and can be found in tropical, subtropical and temperate waters throughout the world (Marquez, 1990). • The species are planktivorous throughout their life, feeding on jellyfish and large planktonic ascidians (e.g., sea squirts) in the water column (Limpus, 2009). • Small numbers of leatherback turtles nest infrequently on the Cobourg Peninsula and there have been unconfirmed accounts of leatherback turtles nesting in WA (DoEE, 2017a). • Leatherback turtles are known to forage and migrate throughout Australia, but are more commonly found in	Given the species distribution, and low density population in Australian waters, the presence of the species within the operational area and MEZ is expected to be low.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
		Australian waters along the east coast and in Bass Strait (DoEE, 2017a).	
Hawksbill Turtle *Eretmochelys imbricata*	Vulnerable, Migratory	• Hawksbill turtles are found in nearshore and offshore reef habitats, and are omnivorous, feeding on algae, sponges, soft coral and other soft-bodies invertebrates (Whiting et al. 2014). • Genetic studies indicate that the WA rookeries form a distinct genetic stock (Fitzsimmons and Limpus, 2014). The most significant breeding areas are around sandy beaches within the Dampier Archipelago, Montebello Islands, Lowendal Islands and Barrow Island (Pendoley, 2005; Limpus, 2009). • The closest known significant breeding/nesting grounds (BIAs) to the operational area are Delambre Island (and other Dampier Archipelago Islands) at ~122 km to the south-southeast and the Montebello Islands (Hermite, North West and Trimouille) at ~137 km to the southwest of the operational area (**Figure 4-9**). • Internesting habitat is located immediately seaward of designated nesting habitat of marine turtles. The internesting habitat buffer for hawksbill turtles is 20 km (DoEE, 2017a). • Due to the distance offshore of the operational area, hawksbill turtles are unlikely to be encountered, and those that are will of a transitory nature.	Due to the distance offshore of the operational area, hawksbill turtles are unlikely to be encountered. Transitory turtles may occur within the MEZ.
Flatback Turtle *Natator depressus*	Vulnerable, Migratory	• The flatback turtle is endemic, and found in the tropical waters of northern Australia. They are the second most abundant species of turtle on the NWS. • Flatback turtles forage across the Australian continental shelf and into the continental waters off Indonesia and Papua New Guinea. They are primarily carnivorous, feeding on soft-bodied invertebrates (DoEE, 2017a). • The species migrates between the Pilbara region of WA to the northern reaches of the state and Irian Jaya (Whittock et al. 2016). The closest nesting sites to the operational area are the Dampier Archipelago at ~125 km to the south-southeast, Legendre and Huay Islands at ~128 km to the southeast and the Montebello Islands (Hermite, North West and Trimouille) at ~137 km to the southwest of the operational area (**Figure 4-9**). • Studies indicate that flatback turtles generally have a broader internesting distribution than other turtles (Waayers et al. 2011). Flatback turtles tend to travel at least 26 km from their nesting beach, and have been recorded up to 48 km (Waayers et al. 2011). The internesting habitat buffer for flatback turtles is 60 km (DoEE, 2017a).	Given the distance from known nesting beaches and aggregation areas, it is unlikely that significant numbers of flatback turtles will be encountered within the operational area. Due to the water depths the area does not provide foraging habitat. Due to the small amount of overlap of the MEZ and internesting buffer, presence within the MEZ is likely to be limited.
Short-nosed sea snake *Aipysurus apraefrontalis*	Critically Endangered	• The short-nosed sea snake is a fully marine, small snake and is endemic to WA. • The species prefers the reef flats or shallow waters along the outer reef edge in water depths to 10 m (Cogger 2000; McCosker 1975), with very few reported moving as far as 50 m away from the reef flat (Guinea and Whiting, 2005).	Given the species preference for shallow water and reef flats, the presence of the species within the operational area and MEZ is likely to be limited.

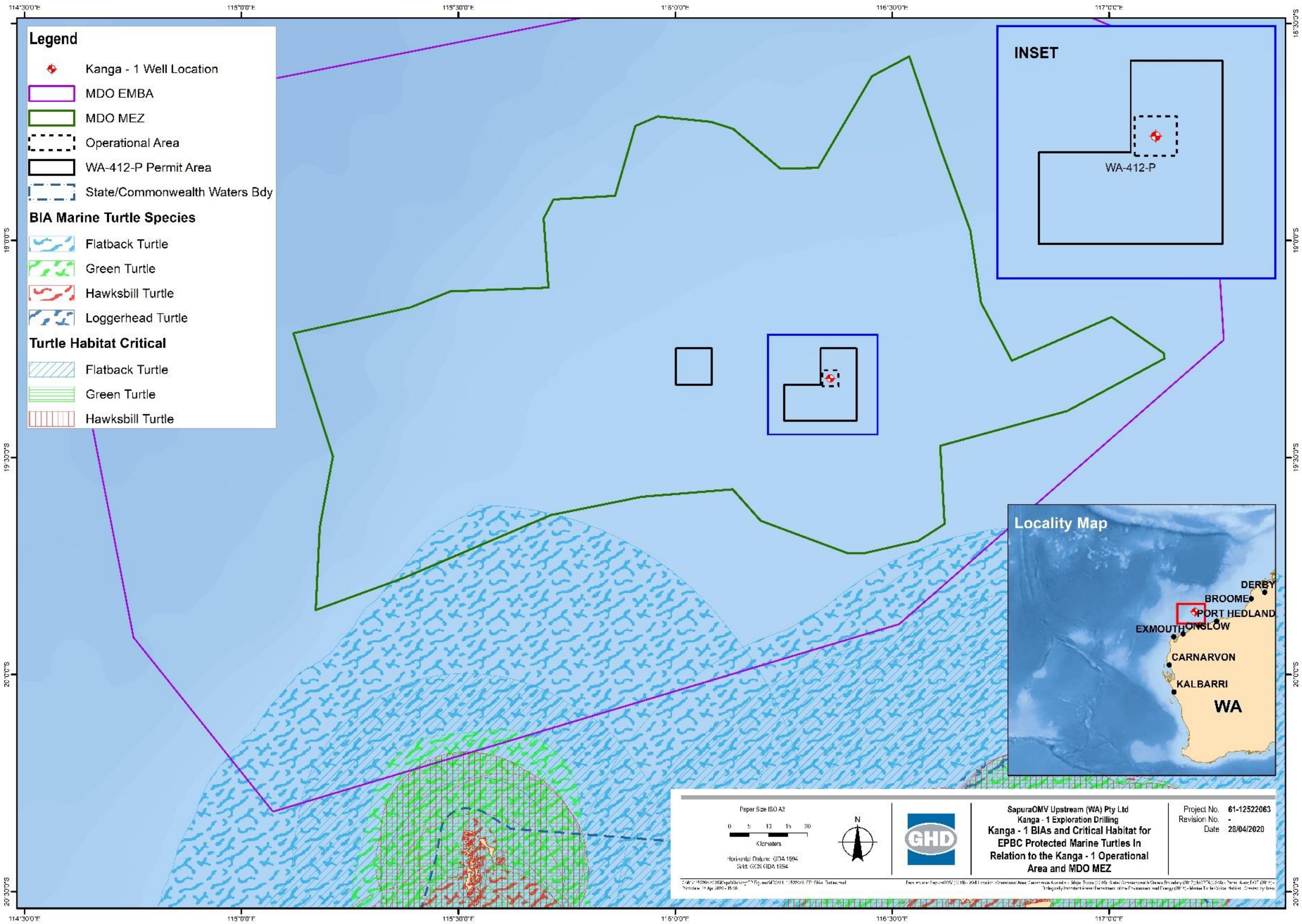


Figure 4-9 BIAs for marine turtles within the vicinity of the operational area and MEZ

4.6.5 Sharks and Rays

The NWMR experiences high species richness of shark, sawfish and rays stemming from the diversity of marine environments (DSEWPaC, 2012a). Of the approximately 500 shark species found worldwide, 19% (94) are found in the region (DEWHA, 2008a).

Three threatened and migratory, and five migratory shark and ray species were identified by a search of the EPBC Act Protected Matters database as potentially occurring in the operational area. One additional threatened species may occur in the MEZ, and one additional threatened and migratory species may occur in the EMBA (**Table 4-2)**.

A description of the identified threatened and/or migratory shark and ray species is provided in **Table 4-8**, including their distribution, migratory movements, preferred habitat and likely presence within the operational area and MEZ. The BIA that overlaps the operational area represents waters where solitary whale sharks may forage during migration to and from Ningaloo (**Figure 4-10**). It extends at widths of up to ~220 km along the entire northwest coast of Australia.

Table 4-8 Threatened and migratory sharks and rays

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Great White Shark *Carcharodon carcharias*	Vulnerable, Migratory	• In Australian waters, great white sharks are widely but not evenly distributed, with observations more frequent in some areas (i.e. pinniped colonies) (DSEWPaC, 2013). Great white sharks can be found in areas close inshore around rocky reefs, surf beaches and shallow coastal bays and also as far out as the outer continental shelf and slope areas (Pogonoski et al. 2002). • The species is known to undertake migrations along the WA coast, with individuals occasionally travelling as far north as North West Cape during spring, before returning south for summer (DSEWPaC, 2013). However, the movements of individuals are not coordinated with each other, so that great white sharks can be recorded in northern localities at any time of the year (Bruce and Bradford, 2008).	Given that great white sharks are often found in regions with high prey density, such as pinniped colonies, it is considered unlikely that they will be encountered within the operational area or MEZ.
Green Sawfish *Pristis zijsron*	Vulnerable, Migratory	• The green sawfish was once known to occur across the Indo-west Pacific region, but current estimates suggest they have experienced substantial population declines and Australia probably represents the last secure population across their range (Stevens et al. 2005). Within Australia, green sawfish are currently distributed from approximately the Whitsundays in Queensland, across northern Australian waters to Shark Bay in WA (DoE, 2015b). • Green sawfish occur in inshore coastal environments including estuaries, river mouths, embayments, and along sandy and muddy beaches, as well as offshore marine habitats (Stevens et al. 2005; Thorburn et al. 2004). They have been recorded in very shallow water (less than one metre) to offshore trawl grounds in over 70 m of water (Stevens et al. 2005). Despite being found in deep water, evidence suggests that the range of green sawfish is mostly restricted to the inshore coastal fringe, with a strong association with mangroves and adjacent mudflats (Stevens et al. 2008). • Green sawfish appear to actively pursue schools of baitfish and prawns (Peverell and Pillans, 2004).	Given the species preferred habitat, individuals are not expected to be present in the operational area or MEZ.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Whale Shark *Rhincodon typus*	Vulnerable, Migratory	• Whale sharks have a global distribution in tropical and warm temperate waters. In Australia, whale sharks occur mainly off the Northern Territory, Queensland, and northern WA. Isolated records exist of whale sharks off NSW, Victoria and South Australia (Last and Stevens, 2009). • Whale sharks form seasonal aggregations at Ningaloo Reef, WA (March – July); off the coastal waters off Christmas Island (December – January); and in the Coral Sea (November – December). These seasonal aggregations are thought to be linked to localised seasonal 'pulses' of food productivity. These aggregations are all considered BIAs for whale sharks (TSSC, 2015d). • At Ningaloo Reef, aggregations of whale sharks (mostly juvenile males <8 m total length) occur where the continental shelf reaches its narrowest point (~10 km) (Meekan et al. 2006; Norman et al. 2017). But, whale sharks stay within a few kilometres of the shore and in waters about 30–50 m deep (Wilson et al. 2006). • A recent study revealed an extended distribution of whale sharks along the WA coastline (Norman et al. 2016), and while some animals are present only during the austral autumn, others may remain resident along the coast for all months of the calendar year (Norman et al. 2016). • The 200 m isobath along the northern part of the WA coast is an important migration route, with migration occurring mainly between July and November. Research on the migration patterns of whale sharks in the western Indian Ocean, indicates that a small number of the WA (Ningaloo) population migrate through the wider vicinity of the Browse Basin region (Meekan and Radford, 2010). • Whale sharks from Ningaloo Reef fitted with satellite trackers were observed to travel either NE towards Timor Leste, or NW towards the Indonesia islands of Sumatra and Java, with some individuals passing through the broad vicinity of Scott Reef (Wilson et al. 2006; Meekan and Radford, 2010). • Whale shark seasonal presence within the operational area is expected between September – November, as they depart Ningaloo Reef on their migration north.	The whale shark BIA for foraging overlaps the operational area and MEZ. It is expected that whale sharks may traverse the operational area and MEZ during their migrations to and from the Ningaloo Reef, but that their presence would be of a relatively short duration and in low numbers.
Narrow Sawfish *Anoxpristis cuspidata*	Migratory	• The central coasts of western and eastern Australia are confirmed as the southernmost extent of the narrow sawfish (D'Anastasi et al. 2013). In Australia, the species may have a broad tropical distribution from approximately North West Cape in WA to southern Queensland. • The narrow sawfish is a bentho-pelagic species that inhabits estuarine, inshore and offshore waters to at least 40 m depth. Inshore and estuarine waters are critical habitats for juveniles and pupping females, whilst adults predominantly occur offshore (D'Anastasi et al. 2013). • Like other sawfish species, the narrow sawfish has experienced considerable decline in numbers due to human activities, including fishing pressure, and habitat loss and degradation (Bray, 2020).	Given the species preferred habitat, presence within the operational area and MEZ is not expected.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Shortfin Mako Shark *Isurus oxyrinchus*	Migratory	• The shortfin mako is a large pelagic shark and has a circumglobal distribution inhabiting tropical and temperate waters. It is rarely encountered in waters with temperatures below 16° C (Last and Stevens, 2009). • In Australian waters, the shortfin mako has been recorded in offshore waters all around the continent's coastline except for the Arafura Sea, Gulf of Carpentaria and Torres Strait. The shortfin mako is highly migratory and can travel large distances, migrating from Australian waters to areas well beyond the Australian EEZ (Rogers et al. 2009). • The shortfin mako preferentially inhabits depths from the surface to 600 m, with a slight preference to shallower water at night (Rogers et al. 2009). However, studies have found that the majority of time is spent in the top 50 m (Nasby-Lucas et al. 2019). • Little is known about the population size and distribution in WA as they are highly migratory and travel large distances.	Given the species distribution and migratory behaviour, it is possible some individuals may transit through the operational area and MEZ.
Longfin Mako Shark *Isurus paucus*	Migratory	• The longfin mako co-inhabits much of the same range as the shortfin mako within Australian waters (Last and Stevens, 2009). However, the longfin mako is thought to be much less common, have a more tropical distribution (Last and Stevens, 2009; Rowling et al. 2010), and its preferred depth distribution is deeper than that of the shortfin mako (Rigby et al. 2019).	Given the species apparent low density and preference for deeper waters, their presence in the operational area and MEZ is expected to be low.
Reef Manta Ray *Manta alfredi*	Migratory	• The reef manta ray is widely distributed in tropical and sub-tropical waters throughout much of the Indian and Pacific Oceans, from the surface down to depths of 432 m (Lawson et al. 2017). It is commonly sighted inshore, but is also found around offshore coral reefs, rocky reefs and seamounts (Marshall et al. 2009). • Long-term sighting records of the reef manta ray at established aggregation sites suggest this species is more resident in tropical waters and may exhibit smaller home ranges, philopatric movement patterns and shorter seasonal migrations than the giant manta ray (Marshall et al. 2019).	Given the species' habitat preferences, their presence in the operational area and MEZ is expected to be limited.
Giant Manta Ray *Manta birostris*	Migratory	• The giant manta ray inhabits tropical, marine waters worldwide, but is also found occasionally in temperate areas. In Australia, the species is recorded from south-western WA, around the north coast and south to the southern coast of NSW (McGrouther, 2019). • The species is commonly sighted along productive coastlines with regular upwelling, oceanic island groups, particularly offshore pinnacles and seamounts. It is commonly encountered on shallow reefs, while being cleaned, or is sighted feeding at the surface inshore and offshore. It is also occasionally observed in sandy bottom areas and seagrass beds (Marshall et al. 2018). • A global investigation of major aggregation sites revealed that the giant manta ray may be a more oceanic and a more migratory species than the Reef Manta Ray (Marshall et al. 2018).	Given the species wide distribution, presence within the operational area and MEZ is expected to be low.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Grey Nurse Shark (west coast) *Carcharias taurus*	Vulnerable	• The grey nurse shark has a broad inshore distribution, primarily in subtropical to warm temperate waters (Pollard and Smith, 2009). • In Australia is restricted to two populations, one on the east coast from southern Queensland to southern NSW and the other around the south-west coast of WA, but has been recorded as far north as the NWS (DAWE, 2020a). • The grey nurse shark occurs either alone or in small to medium-sized aggregations of 20-80 individuals. They are generally coastal, usually being found from the surf zone down to depths of around 25 m. However, they may also occasionally be found in shallow bays, around coral reefs and, very rarely, to depths of around 200 m on the continental shelf (Pollard and Smith, 2009).	Given the species is generally associated with coastal environments, their presence within the MEZ is expected to be limited.

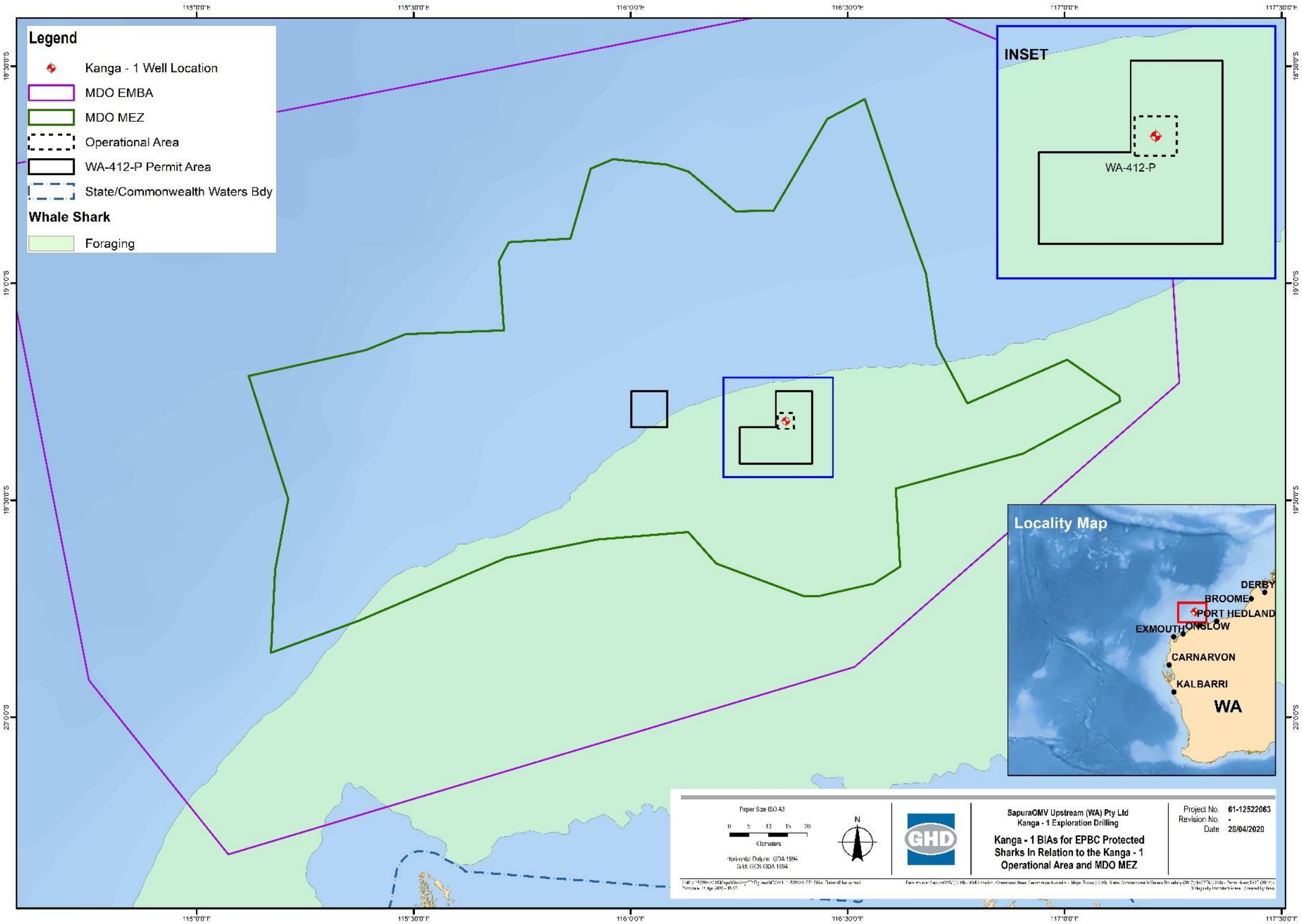


Figure 4-10 BIAs for sharks within the vicinity of the operational area and MEZ

4.6.6 Marine Birds

Many migratory shorebirds (including those frequenting offshore islands) and seabird species are known to occur in the NWMR. Forty-one seabird species listed under the EPBC Act are known to occur within the NWMR. Of these, the region is considered to be particularly important for nine species as substantial proportions of their populations use the region and adjacent waters for breeding, foraging and other life history phases (DSEWPaC, 2012a).

Migratory shorebird species forage and rest in the region on their way between northern hemisphere breeding grounds and northern Australian feeding grounds, known as the East Asian–Australasian Flyway. Seabird species spend the majority of their lives foraging across large distances over the open ocean and many also breed within the region.

Two threatened and migratory, and seven migratory marine bird species were identified by a search of the EPBC Act Protected Matters database as potentially occurring in the operational area. One additional threatened species and one migratory species may occur in the MEZ, and one additional threatened and one threatened and migratory species may occur in the EMBA (**Table 4-2)**.

A description of the identified threatened and/or migratory marine bird species is provided in **Table 4-9**, including their distribution, migratory movements, preferred habitat and likely presence within the operational area and MEZ. No seabird or shorebird BIAs overlap the operational area. The wedge-tailed shearwater breeding BIA overlaps the MEZ and EMBA (**Figure 4-11**).

Table 4-9 Threatened and Migratory seabirds and shorebirds

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Red Knot *Calidris canutus*	Endangered, Migratory	• The red knot is a migratory shorebird and undertakes long distance migrations from breeding grounds in Siberia, where it breeds during the boreal summer, to the southern hemisphere during the austral summer. • Both Australia and New Zealand host significant numbers of red knots during their non-breeding period (Bamford et al. 2008). • As with other migratory shorebirds, this species occurs in coastal wetland and intertidal sand or mudflats, where they feed on intertidal invertebrates, especially shellfish (Garnet et al. 2011). • Peak numbers of this species in the NWMR are usually between September and October.	Due to the lack of emergent habitat, red knots are unlikely to occur frequently in the operational area or MEZ, aside from individuals occasionally transiting through during migrations (September/October).
Eastern curlew *Numenius madagascariensis*	Critically Endangered, Migratory	• The eastern curlew is the largest migratory shorebird in the world. Within Australia, the eastern curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and southeast regions. They have a continuous distribution from Barrow Island and Dampier Archipelago, WA, through the Kimberley and along the Northern Territory, Queensland, and NSW coasts and the islands of Torres Strait (DoE, 2015c). • The eastern curlew does not breed in Australia but it is estimated that 73% of the population spends the non-breeding season here (DoE, 2015c). • The species is present in Australia between August and December. During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal	Given the species distribution and preferred habitat, their presence in the operational area and MEZ is likely to be restricted to individuals transiting through the area during their seasonal migration periods.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
		lagoons, with large intertidal mudflats or sandflats (DoE, 2015c).	
Common noddy *Anous stolidus*	Migratory	• In Australia, the common noddy occurs mainly in ocean off the Queensland coast, but the species also occurs off the northwest and central WA coast (DAWE, 2020a). • During the breeding season, the common noddy usually occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand, with individuals remaining close to the nest, foraging in the surrounding waters. Breeding can occur throughout the year at some sites, but at others there is a peak of breeding in spring and another in autumn (Pizzey and Knight, 2012). • During the non-breeding season the species occurs throughout the pelagic zone (DAWE, 2020a). It is a wide-ranging species, but there is no seasonal migration associated with breeding. It is probably dispersive from colonies in March and April (Pizzey and Knight, 2012) • The common noddy feeds mainly on fish, although they are known to also take squid, pelagic molluscs, medusa and aquatic insects.	Given the wide distribution of the species and preferred habitat, this species may be present in low numbers in the operational area and MEZ
Streaked shearwater *Calonectris leucomelas*	Migratory	• Streaked shearwaters are found in the western pacific, breeding on the coast and offshore islands. They migrate south during winter and can be found off the coast of Australia between November and March (Yamamoto et al. 2010). • This species can be found in both pelagic and inshore waters. It feeds mainly on fish and squid which it catches by surface-seizing and shallow plunges (Birdlife International, 2020).	Given the distribution of the species and preferred habitat, this species may be present in low numbers in the operational area and MEZ during the November to March period.
Lesser frigatebird *Fregata ariel*	Migratory	• The lesser frigatebird is the most widespread frigatebird in Australia, found throughout the temperate waters of the Indian Ocean (DEWHA, 2008a). The species feeds mostly on fish (taken in flight) and sometimes indulges in kleptoparasitism. Lesser frigatebirds generally forage close to breeding colonies (DEWSPaC, 2012a). • Within the NWMR, the lesser frigatebird is known to breed on Adele, Bedout and West Lacepede islands, Ashmore Reef and Cartier Islands (DSEWPaC, 2012a). Breeding occurs between March and September along the Kimberley and Pilbara coast and Islands (DAWE, 2020b). • The closest breeding BIA is ~182 km east of the operational area.	Given the distribution of the species and preferred habitat, this species may be present in low numbers in the operational area and MEZ
Great frigatebird *Fregata minor*	Migratory	• The great frigatebird has a wide distribution throughout the world's tropical seas. Great frigatebirds undertake regular migrations across their range, both regular trips and more infrequent widespread dispersals. • The closest known breeding colonies occur on Ashmore Reef and Adele Island (DAWE, 2020b). Breeding occurs from May – June and August (DAWE, 2020b). • The great frigatebird forages in pelagic waters within 80 km of a breeding colony or roosting areas (ALA, 2020). Flying fish are the most common item in the diet; other fish species and squid may be eaten as	Given the wide distribution of the species and preferred habitat, this species may be present in low numbers in the operational area and MEZ.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
		well. Prey is snatched while in flight, either from just below the surface or from the air in the case of flying fish flushed from the water. Like all frigatebirds they will not alight on the water surface and are usually incapable of taking off should they accidentally do so. • The closest breeding BIA is ~724 km from the operational area.	
Common sandpiper *Actitis hypoleucos*	Migratory	• The common sandpiper is a small, migratory bird with a very large range through which it migrates annually between breeding grounds in the northern hemisphere (Russia) and non-breeding areas in the Asia-Pacific region (Bamford et al. 2008). • This species is a full migrant. It breeds in Europe and Asia within the period April to August, with the southward migration from July-November. Individuals arrive from July onwards in South Australia, WA and the Northern Territory (DAWE, 2020a). Northward migration is from February-May, or early June (DAWE, 2020a). • In Australia, the common sandpiper is found in coastal or inland wetlands, both saline and fresh. It is found mainly on muddy edges or rocky shores.	Given the species distribution and preferred habitat, their presence in the operational area and MEZ is likely to be restricted to individuals transiting through the area during their seasonal migration periods.
Sharp-tailed sandpiper *Calidris acuminata*	Migratory	• The sharp-tailed sandpiper is a migratory wading shorebird, and spend their non-breeding season in Australian waters. The species is widespread across WA waters and coastlines inhabiting both freshwater and saline areas (DAWE, 2020a). Roosting on sandy beaches and muddy flats the omnivorous species feeds on seeds, crustaceans, molluscs, and insects (Higgins and Davies, 1996). • The species may occur in Australia from mid-August when they start arriving, until April when they depart for their breeding grounds. Very few are reported to remain to winter in Australia.	Given this species wide distribution and preferred habitat, their presence in the operational area and MEZ is likely to be restricted to individuals transiting through the area during their seasonal migration periods (mid-August-April).
Pectoral sandpiper *Calidris melanotos*	Migratory	• The pectoral sandpiper is a medium-small migratory wader that breeds in the northern hemisphere and migrates to the southern hemisphere during the boreal winter. Therefore, it does not breed, but can be found throughout Australia, although numbers in WA are limited (DAWE, 2020a). • The species forages in shallow waters and mud flats, and is present in Australia from September-June in coastal or near coastal habitats feeding on algae, seeds and insects (DAWE, 2020a).	Given this species wide distribution and preferred habitat, their presence in the operational area and MEZ is likely to be restricted to individuals transiting through the area during their seasonal migration periods (September-June).
Australian fairy tern *Sternula nereis nereis*	Vulnerable	• The Australian fairy tern occurs on the coast of WA as far north as Dampier Archipelago (DSEWPaC, 2012a). Fairy terns utilise a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands, beaches and spits (DSEWPaC, 2011b). • The fairy tern mostly breeds from July-September and may be present during the non-breeding season. Fairy terns nest on sites where the substrate is sandy and the vegetation low and sparse (DSEWPaC, 2011b). • The fairy tern forages in inshore waters, around island archipelagos and on the mainland. It feeds almost entirely on fish (Higgins and Davies 1996).	Due to the lack of emergent habitat, fairy terns are unlikely to occur frequently in the operational area and MEZ, aside from individuals occasionally transiting through.

Species	EPBC Act Status	Distribution, Habitat and Life Cycle	Presence in the Operational Area and MEZ
Osprey *Pandion haliaetus*	Migratory	• The breeding range of the osprey extends around the northern coast of Australia (including many offshore islands) from Albany in WA to Lake Macquarie in NSW (DAWE, 2020a). • Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland (DAWE, 2020a). • Ospreys occupy large territories that are used for breeding and at least some foraging (Marchant and Higgins 1993). Territories are attended throughout the year although visits may be only intermittent in the non-breeding season • Ospreys mainly feed on fish and usually forage diurnally.	Given the preferred coastal habitat, the species is unlikely to be present in the operational area or MEZ.

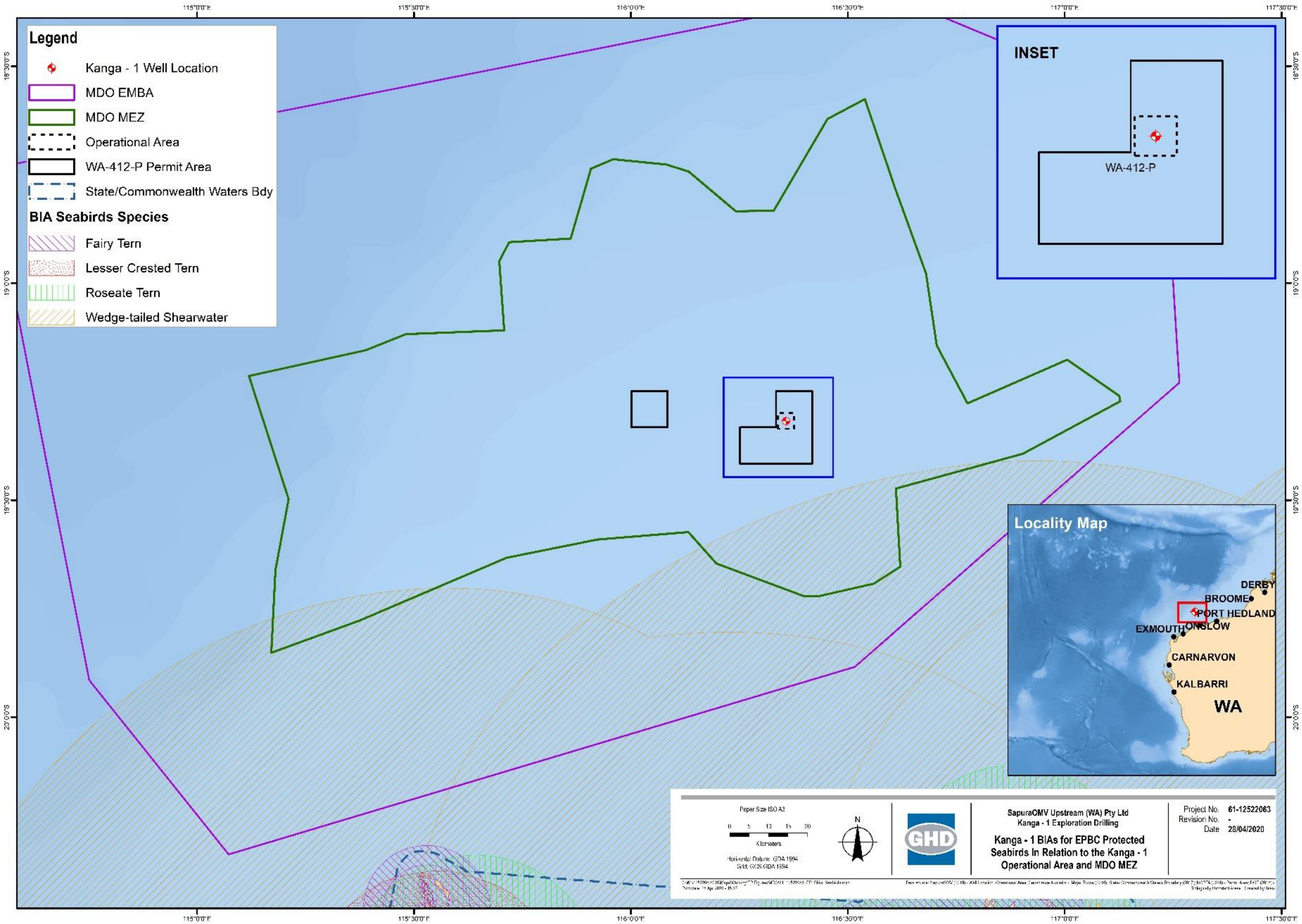


Figure 4-11 BIAs for seabirds and shorebirds within the vicinity of the operational area and MEZ

4.6.7 Timing of Key Biological Receptors

Table 4-10 summarises the approximate timing of key ecological receptors that may occur within the vicinity of the operational area.

Table 4-10 Temporal windows of key biological receptors relative to the operational area

Receptor	Event	January	February	March	April	May	June	July	August	September	October	November	December	Reference
Pygmy blue whale	Northern migration				Low	Peak	Peak	Low	Low					Double et al. 2014; DoE, 2015a
	Southern migration	Low									Low	Peak	Peak	
Humpback whale	Northern migration					Low	Low	Peak	Peak					Jenner et al. 2001; Thums et al. 2018 ; DMP, 2013
	Southern migration								Peak	Peak	Peak			
Green turtle	Mating									Known	Known	Known	Known	DoEE, 2017a
	Nesting	Peak	Peak	Low								Low	Peak	
	Hatching	Low	Peak	Peak	Low	Low								
Hawksbill turtle	Mating	Known	Known	Known	Known	Known	Known	Known	Known	Known	Known	Known	Known	DoEE, 2017a
	Nesting	Peak	Low	Low	Low	Low	Low	Low	Low	Low	Peak	Peak	Peak	
	Hatching	Peak	Peak	Low	Low	Low	Low	Low	Low	Low	Low	Low	Peak	
Flatback turtle	Mating	Known								Known	Known	Known	Known	DoEE, 2017a
	Nesting	Peak	Low	Low							Low	Peak	Peak	
	Hatching		Peak	Peak										
Whale shark	Foraging/ migration			Low	Low	Low	Low	Low	Low	Peak	Peak	Peak		DAWE, 2020a & b; TSSC, 2015d
Wedge-tailed shearwater	Breeding	Low	Low	Low	Low				Low	Low	Peak	Peak	Low	DAWE, 2020a, DAWE, 2020b

Key	
Peak	Peak activity level
Low	Low activity level
Known	Known activity period

4.7 Socio-economic Environment

4.7.1 Commercial Fisheries

Offshore and coastal waters in the NWMR support a valuable and diverse commercial fishing industry. The major fisheries in the Pilbara region target tropical finfish, large pelagic fish, crustaceans (prawns and scampi) and pearl oysters (Patterson et al. 2019). Based on available information, including consultation outcomes, no commercial fishing is expected to occur within the operational area.

4.7.1.1 Commonwealth Managed Fisheries

Commonwealth fisheries are those within the 200 nm Australian Fishing Zone (AFZ) which are managed by the Australian Fisheries Management Authority (AFMA). The information on Commonwealth-managed fisheries is from fisheries status ABARES reports (Patterson et al. 2019) and direct consultation with the fishing industry (**Section 5**).

The management areas for three Commonwealth-managed fisheries overlap the operational area (**Figure 4-12)**:

- Southern Blue Fin Tuna;
- Western Skipjack Tuna; and
- Western Tuna and Billfish.

While these fisheries are authorised to operate in the area, no active fishing within the operational area has occurred for at least five years (see **Table 4-11**). One additional commonwealth-managed fishery has management areas that intersect with the MEZ and EMBA:

- Northwest Slope Trawl Fishery.

Table 4-11 Commonwealth-managed commercial fisheries with management zones overlapping the operational area, MEZ and EMBA

Fishery	Description
Southern Bluefin Tuna Fishery	Most of the Australian fishing effort for southern bluefin tuna is by purse-seine vessels in the Great Australian Bight and waters off South Australia. The number of vessels in the purse-seine fishery has been fairly stable, ranging from five to eight since the 1994–95 fishing season. Since 2011, most fishing has occurred in the east of the Bight, closer to Port Lincoln. The number of longline vessels fishing for southern bluefin tuna off the east coast of Australia has been more variable, ranging from 11 to 24 vessels during the past 10 years. Southern bluefin tuna have been documented to spawn on the NWS between September and March and larvae are seasonally abundant in surface waters during these months. There is no current fishing effort on the NWS (Patterson et al. 2019). **Activity:** While there are active fishers in WA waters, there has been no active fishing on the NWS in recent years, as fishing efforts are concentrated off South Australia (Patterson et al. 2019).
Western Skipjack Tuna Fishery	The Western Skipjack Tuna Fishery targets skipjack tuna (*Katsuwonus pelamis*) and is licensed to fish throughout WA waters. The fishery employs the purse seine, pole and line and longline methods as its techniques. Historically, effort on the NWS has been low, and fishing effort has been focussed on southeast Australia. **Activity:** There has been no effort in this fishery since the 2008-09 fishing season, and in that season, activity was concentrated off South Australia (Patterson et al. 2019).
Western Tuna and Billfish Fishery	The Western Tuna and Billfish Fishery boundary extends westward from Cape York Peninsula in Queensland, around WA, to the border between Victoria and South Australia. The fishery is primarily a longline fishery targeting bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), striped marlin (*Kajikia audax*) and swordfish (*Xiphias gladius*). The main fishing gear is pelagic longline, with low levels of minor-line fishing.

Fishery	Description
	Since 2005, fewer than five vessels have been active in the fishery each year, with only 3 active in 2018 (Patterson et al. 2019). **Activity:** There has been no active commercial fishing in the operational area, or on the NWS in recent years. This was confirmed in consultation with AFMA (**Section 5**).
Northwest Slope Trawl Fishery	Extends from 114° E to approximately 125° E off the WA coast between the 200-m isobath and the outer limit of the AFZ. This has predominantly been a scampi fishery using demersal trawl gear. In the 2017-18 fishing season, there were six fishing permits, four active vessels and effort occurred over 219 days (Patterson et al. 2019). **Activity:** The fishery does not overlap the operational area, but occurs within the MEZ and EMBA.

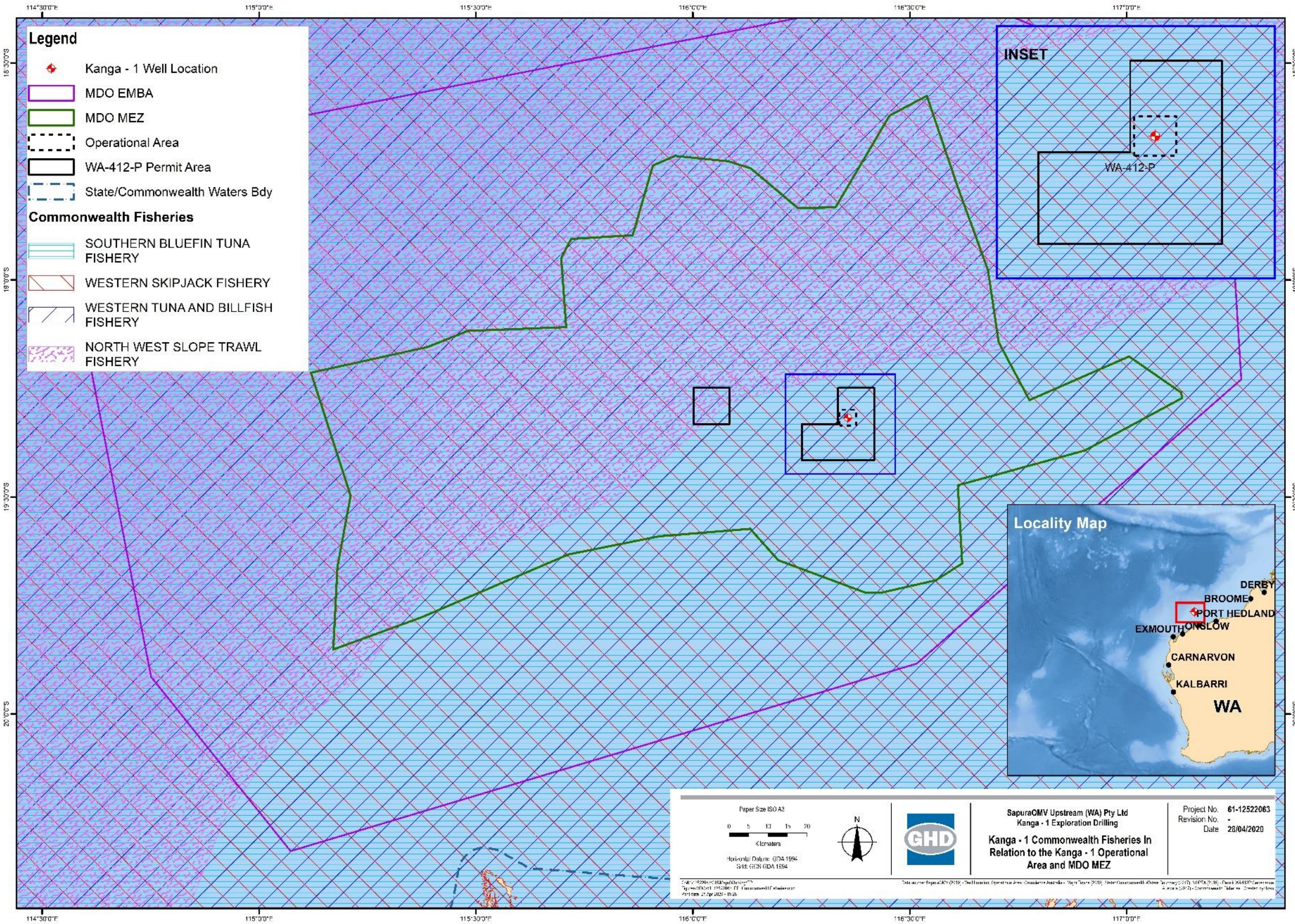


Figure 4-12 Commonwealth fisheries with management zones overlapping the operational area and MEZ

4.7.1.2 State Managed Fisheries

State fisheries are managed by the Department of Primary Industries and Regional Development (DPIRD) with specific management plans, regulations and a variety of subsidiary regulatory instruments under the WA *Fish Resources Management Act 1994*. The information on State managed fisheries has been derived from the *State of Fisheries, Status Reports of the Fisheries and Aquatic Resources of Western Australia* (Gaughan et al. 2019) and direct consultation with the fishing industry (**Section 5**).

The management areas for ten State managed fisheries overlap the operational area (**Figure 4-13)**:

- Abalone Managed Fishery (Areas 4 & 8);
- Marine Aquarium Fish Managed Fishery;
- Mackerel Managed Fishery (Area 2);
- Onslow Prawn Managed Fishery (Area 3);
- Pilbara Demersal Scalefish Fishery (Area 6) (trap, line and trawl);
- South West Coast Salmon Fishery;
- Specimen Shell Managed Fishery;
- West Coast Deep Sea Crustacean Managed Fishery;
- Pearl Oyster Managed Fishery; and
- North Coast Shark Fishery.

While these fisheries are authorised to operatein the area, no active fishing within the operational area has occurred for at least five years (see **Table 4-12**). One additional state managed fishery overlaps the MEZ and EMBA:

- Nickol Bay Prawn Managed Fishery.

Table 4-12 State managed commercial fisheries with management zones overlapping the operational area, MEZ and EMBA

Fishery	Description
Abalone Managed Fishery	The Abalone Managed Fishery includes the West Coast Roe's Abalone resource and the South Coast Greenlip / Brownlip Abalone resource. The fishery operates state-wide between the Northern Territory border and South Australian border. Abalone is a dive fishery and operates in shallow coastal waters (<20 m) along southern and western coasts of WA (Hart et al. 2017). **Activity:** No fishing effort or target species occurs in the operational area, given the water depths and lack of suitable habitat. According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
Marine Aquarium Fish Managed Fishery	The fishery is licensed to operate on a state-wide basis throughout WA waters; however, licensees are not able to operate in any protected area. Operators are permitted to take up to 950 species of marine aquarium fishes, coral, live rock, algae, seagrass and invertebrates. The fishery operates by collection of marine aquarium species by hand, by wading or diving (scuba or hookah). This is a limited entry managed fishery with 12 licences (11 active) currently permitted to operate in WA (Newman et al. 2019a). **Activity:** The fishery is diver based, and due to the water depth of the operational area (~147 m), target species will not be present. In addition, there are special handling requirements for live fish; therefore, interaction with fishers are not expected during the activity. According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
Mackerel Managed Fishery	This fishery operates from Cape Leeuwin on the southwest coast to the WA-NT border, with most of the catch landed in the Kimberley and Pilbara regions. The fishery primarily targets Spanish mackerel (*Scomberomorus commerson*) by surface and mid-water trolling from vessels in coastal areas around reefs, shoals and headlands (WAFIC, 2020). Jig fishing is also used to capture grey mackerel (*S. semifasciatus*).

Fishery	Description
	Activity: According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
Onslow Prawn Managed Fishery	The Onslow Prawn Managed Fishery is one of four northern prawn managed fisheries (Kimberley, Broom, Nickol Bay and Onslow) that operate in the North Coast Bioregion. Low opening otter trawl systems target western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*P. esculentus*), and endeavour prawns (*Metapenaeus endeavouri*). High opening, otter trawl systems are also used when targeting banana prawns (*P. merguiensis*). The total landings in 2017 were negligible. Only 5 days of fishing effort was undertaken (one boat) in 2017 (Kangas et al. 2019). **Activity:** Given the level of effort and catch in previous years, interaction with fishers are not expected during the activity. According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
Pilbara Demersal Scalefish Fishery (trap, line and trawl)	This fishery collectively use a combination of vessels, effort allocations (time), gear limits, plus spatial zones (including extensive trawl closures) as management measures. The main species landed in the Pilbara subregion are bluespotted emperor, red emperor, and rankin cod (Newman et al. 2019b). It is estimated that ~10 fishers on 2 vessels were directly employed during 2017 in the trawl sector, and 8 fishers on 3 vessels in the trap sector, and at least ~15 fishers on 5 vessels in the line sector. Overall, at least ~33 people (e.g. 3-4 crew per vessel) were directly employed in this fishery. There has been no fish trawl effort allocation in Area 6 since 1998 (Newman et al. 2019b). Fishing vessels may occur around the operational area, but no fishing activity within the operational area has been recorded in recent years. The Pilbara Line Fishery fishing boat licensees are permitted to operate anywhere within "Pilbara waters", bounded by a line commencing at the intersection of 21°56' S latitude and the high water mark on the western side of the North West Cape on the mainland of WA; west along the parallel to the intersection of 21°56' S latitude and the boundary of the AFZ and north to longitude 120° E. In the 2018 season there were nine individual licences in the Pilbara Line Fishery, held by seven operators (Newman et al. 2019b). **Activity:** According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
South-west Coast Salmon Fishery	Commercial fishers in WA traditionally target salmon during the annual autumn 'salmon run' in March/April when large schools form near shore and move around the coast to their spawning area on the lower west coast. Salmon fishers use a beach seine net to catch fish, however they may also be caught by rod and line from the beach. Fishers typically 'spot' large salmon schools and then use small boats to deploy nets around the schools before pulling them ashore (DPIRD, 2020). There are currently six licences. Licensees are not restricted to specific beaches but in practice only a few beaches are fished (DEH, 2004). In 2018 there were three active vessels in this fishery (Stewart et al. 2018). **Activity:** Given the methods of fishing and level of effort and catch in previous years, interaction with fishers are not expected during the activity. According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
Specimen Shell Managed Fishery	The fishery occurs throughout coastal waters of WA based on the collection of shells for display, collection, cataloguing, sale and classification. The main methods are by hand by a small group of divers operating from small boats in shallow coastal waters or by wading along coastal beaches below the high water mark. Remotely operated vehicles are currently being trialled under exemption instruments; these are limited to one per licence (Hart et al. 2019). The fishery encompasses the entire WA coastline, but fishing effort is generally concentrated in areas adjacent to populated centres such as Broome, Exmouth, Perth, Mandurah and Albany (Hart et al. 2019). The fishery has 31 licences with a maximum of 2 divers allowed in the water per licence at any one time and specimens may only be collected by hand. Specimens many only be collected by hand. Of the 31 licences in the fishery, 23 fished in 2017, and nine licences recorded consistent activity (Hart et al. 2019). **Activity:** Given the method by which the fishery operates, fishing activities are unlikely to occur within the operational area. According to DPIRD and Fishcube data, there has been

Fishery	Description
	no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
West Coast Deep Sea Crustacean Managed Fishery	The West Coast Deep Sea Crustacean resource consists primarily of Crystal (snow) (*Chaceon albus*), Champagne (spiny) (*Hypothalassia acerba*) and Giant (king) (*Pseudocarcinus gigas*) crabs. The fishery extends northward from Augusta throughout WA waters on the seaward side of the 150 m isobath out to the extent of the EEZ. It is a 'pot' fishery using baited pots operated in a long-line formation in the shelf edge waters (>150 m) of the West Coast and Gascoyne Bioregions (How and Orme, 2019). In 2017, catches were dominated by crystal crabs. This fishery is considered to have low social amenity, and there is no recreational fishery. There were six vessel operating in 2017 (How and Orme, 2019). Catch effort is concentrated in areas south of Exmouth. **Activity:** Given that fishing effort is concentrated south of Exmouth and in water depths greater than the operational area, interaction with fishers during the activity is unlikely. According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
Pearl Oyster Managed Fishery	The Pearl Oyster Fishery licence area extends from 114° 10’ E near Exmouth to the WA/NT border, and out to the edge of the Australian Fishing Zone (200 nautical miles). The licence area is subdivided into four zones. Zone 1 extends from 114° 10’ E to 119° 30’ E. The principal fishing grounds, holding sites and pearl farms are in waters off Eighty Mile Beach and Broome. A single approved pearl farm lease is located near North Turtle Island and pearl diving activities have previously occurred in coastal waters near Port Hedland and the De Grey river mouth (Hart et al. 2019). **Activity:** Pearl oyster shell fishing has not been reported in Zone 1 since 2008 (Fletcher and Santoro, 2014). Given the method by which the fishery operates, and the location of the main fishing grounds, fishing activities are not expected to occur within the operational area. According to DPIRD and Fishcube data, there has been no recorded commercial fishing activity within the operational area from 2014-2019 (see **Section 5**).
North Coast Shark Fishery	This fishery includes Australian waters north of Broome, from longitude 120° E to 123°45’ E (Koolan Island). **Activity:** This fishery is currently closed to protect the breeding grounds of the resource which support the two southern shark fisheries. No fishing effort since 2008/09.
Nickol Bay Prawn Managed Fishery	The boundaries of this fishery are all the waters of the Indian Ocean and Nickol Bay between 116°45' E longitude and 120° E longitude on the landward side of the 200 m isobath. Primarily targets banana prawns using otter trawl methods along the western part of the NWS in coastal shallow waters (Kangas et al. 2019). **Activity:** No overlap with the fishery and operational area**.** Prawn trawling activities may occur within the MEZ, although target species are usually found in shallow, nearshore waters.

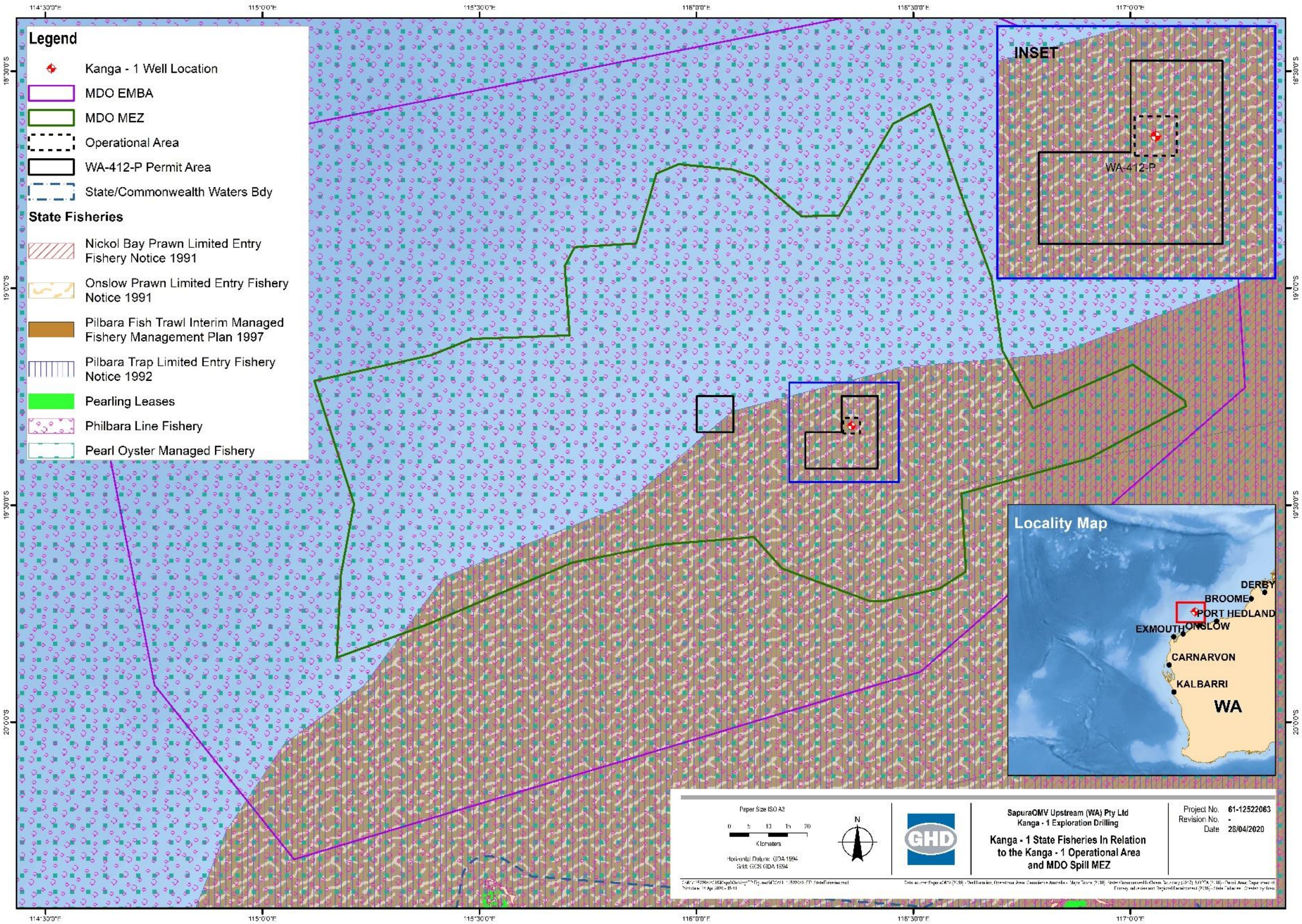


Figure 4-13 State fisheries with management zones overlapping the operational area and MEZ

4.7.2 Marine Tourism and Recreation

Owing to the water depths of the operational area, planned events are not predicted to have an impact on tourism or recreational fishing. There may be sources of marine-based tourism and recreational fishing within the MEZ and EMBA and therefore these could be impacted by an MDO spill due to a vessel collision.

4.7.3 Cultural Heritage

4.7.3.1 Aboriginal Heritage Places

According to the Aboriginal Heritage Inquiry System, no Aboriginal Heritage sites are within the operational area, MEZ or EMBA.

4.7.3.2 Underwater Cultural Heritage

No underwater cultural heritage sites were identified as occurring within the operational area, MEZ or EMBA.

4.7.4 Oil and Gas Industry

Various petroleum exploration and production activities have been undertaken within the NWS. Woodside is currently planning to undertake activities in the adjacent permit areas WA-5-L, WA-16-L and WA-3-L. Vessels servicing these and other oil and gas operations in the region may pass through the area en route to facilities; however, since vessel transit is not classed as a petroleum activity, potential impacts to vessels are discussed under 'Shipping' below.

Oil and gas facilities are not present within the operational area, but do occur within the MEZ and EMBA, as do permits operated by other titleholders (**Figure 4-14**). Thus, oil and gas activities could be impacted by unplanned events.

4.7.5 Shipping

The Australian Maritime Safety Authority (AMSA) has established a network of shipping fairways off the northwest coast of Australia to manage traffic patterns (AMSA, 2013). The closest recognised shipping fairway to the operational area is ~48 km to the east (**Figure 4-14**). Very little vessel traffic has been recorded in the operational area.

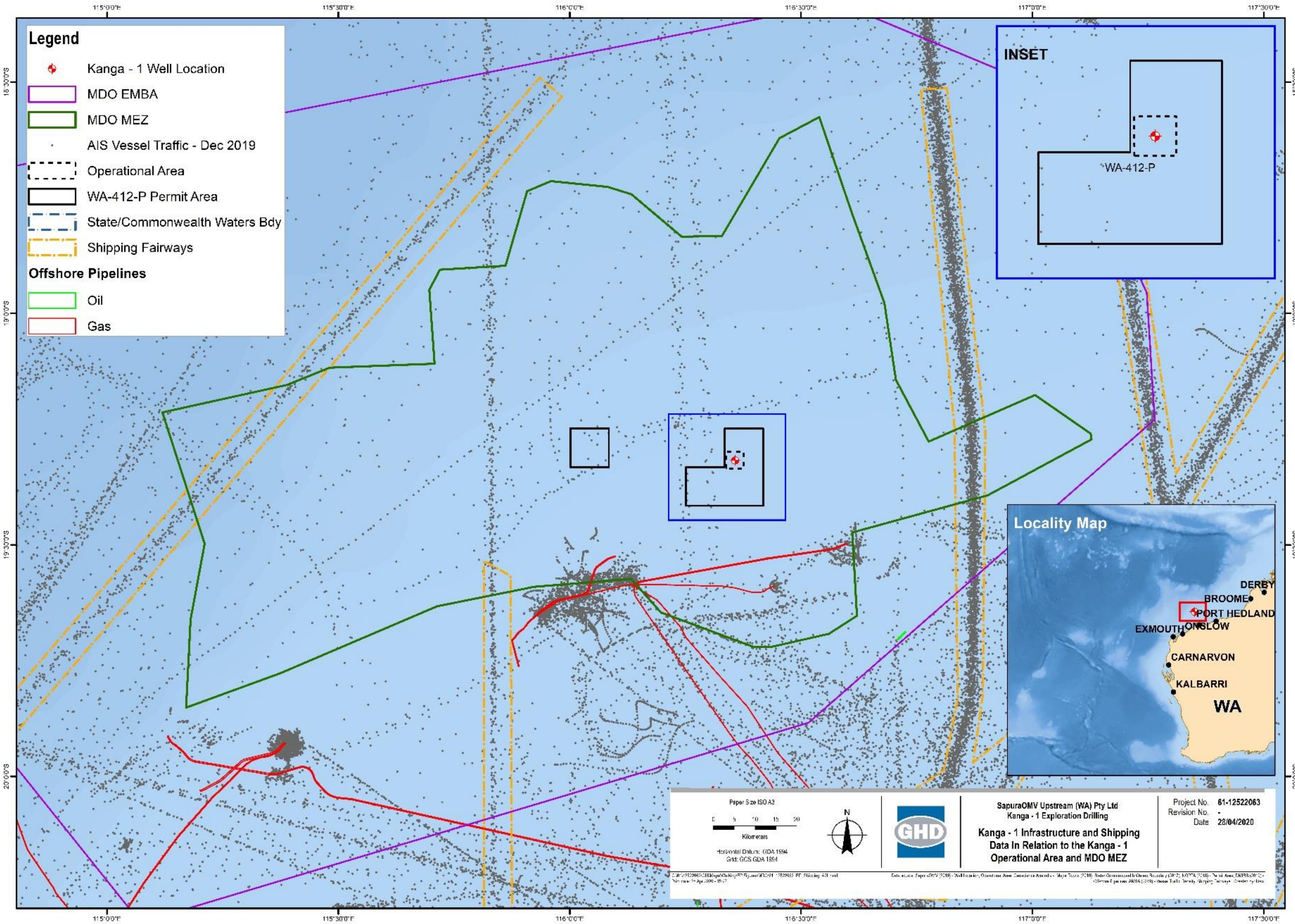


Figure 4-14 Existing petroleum infrastructure and vessel activity in the vicinity of the operational area

5. Stakeholder Consultation

SapuraOMV understands that retaining a social licence to operate depends on the development and maintenance of positive and constructive relationships with a comprehensive set of stakeholders in the community, government, non-government and business sectors.

SapuraOMV is committed to engaging with relevant persons, organisations and communities throughout the process of developing this EP and throughout the activity in an open and honest manner. SapuraOMV strives to be transparent during consultation with relevant persons or organisations, sharing information freely to demonstrate a commitment to transparency. SapuraOMV has considered all feedback received from relevant persons or organisations for incorporation into this EP.

As required under Regulation 11A of the OPGGS(E)R, this section demonstrates that sufficient information and an appropriate level of consultation was undertaken with relevant persons or organisations throughout the course of preparing this EP.

5.1 Regulatory Requirements and Guidelines

Regulation 11A (1) of the OPGGS(E)R 2009 identifies five groups of relevant persons who must be consulted in the course of preparing an environment plan:

a) Each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;

b) Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;

c) The Department of the responsible State Minister, or the responsible Northern Territory Minister;

d) A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan, or the revision of the environment plan; and

e) Any other person or organisation that the titleholder considers relevant.

In developing the EP and the stakeholder consultation process, SapuraOMV referred to guidance documents from NOPSEMA and other relevant stakeholders as follows:

- NOPSEMA
    - GN1488 – Oil pollution risk management – Rev 2 – February 2018
    - GN1785 - Petroleum activities and Australian marine parks – Rev 0 – July 2018
    - GN1344 – Environment plan content requirements – Rev 4 – April 2019
    - GL1721 – Environment plan decision making – Rev 6 – November 2019
    - NOPSEMA Bulletin #2 - Clarifying statutory requirements and good practice consultation – November 2019
    - GL1887 – Consultation with Commonwealth agencies with responsibilities in the Commonwealth marine area – Rev 0 – December 2019
- AFMA
    - Petroleum industry consultation with commercial fishing industry

- Commonwealth Department of Agriculture, Water and the Environment
    - Fisheries and the Environment – Offshore Petroleum and Greenhouse Gas Act 2006
    - Offshore Installation Biosecurity Guide
- Department of Primary Industries and Regional Development
    - Guidance statement for oil and gas industry consultation with the Department of Fisheries
- Department of Transport
    - Offshore Petroleum Industry Guidance Note.

5.2 Consultation Approach

The following approach was used in the consultation process for this EP:

- Stakeholder identification;
- Stakeholder consultation;
- Assessing and managing relevant matters, objections and claims; and
- Ongoing consultation.

These are discussed further in the following sections.

5.3 Stakeholder Identification

The stakeholder identification process commenced in January 2020. Stakeholder identification was based on the collective experience of the project team together with desktop identification and analysis, with consideration of the proposed area of operations and potential impacts and risks. The list was also benchmarked with similar projects within close proximity of the operational area. This facilitated the development of a stakeholder register, which was further refined and continues to be reviewed and updated as the activity planning progresses.

For the stakeholder consultation process for this EP, SapuraOMV refined the relevant persons list based on the 'NOPSEMA Bulletin #2 Clarifying statutory requirements and good practice consultation' (NOPSEMA, 2019b). The stakeholder list for this EP was refined to include the following:

- Statutory agencies with responsibility or jurisdiction in the operational area or adjacent State waters that may be affected by the activity;
- Marine user groups and interest groups active in the operational area (commercial fishers, other oil and gas producers, merchant shipping, etc); and
- Other stakeholders that may have an interest in the operational area.

The need to consult with fisheries licence holders was determined through consultation with AFMA for Commonwealth managed fisheries, and DPIRD (using FishCube data) for WA State managed fisheries.

It is acknowledged that the stakeholder environment can be dynamic. Therefore potentially new stakeholders may emerge and existing stakeholder concerns may change over the planning and implementation of the activity. SapuraOMV's stakeholder register is updated as required, which allows for ongoing stakeholder identification and to support the management of stakeholder relationships in regards to the activity.

Currently identified stakeholders for this activity and an assessment of their relevance to the OPGGS(E)R is provided in **Table 5-1**.

Table 5-1 Relevant stakeholders for the activity

Stakeholder	Relevance based on OPGGS (E) Regulations	Relevance to the Activity
Commonwealth government departments/ agencies		
AFMA	Considered relevant person under Regulation 11A (1) (a)	Australian Government agency responsible for managing Commonwealth fisheries. AFMA is a relevant agency where the activity has the potential to impact fisheries resources. The operational area intersects with management areas for Commonwealth Managed Fisheries.
Australian Hydrographic Office (AHO)	Considered relevant person under Regulation 11A (1) (a)	Australian Government agency responsible for publishing and disseminating nautical charts and other information required for navigational safety, including the distribution of Notice to Mariners.
Australian Maritime Safety Authority (AMSA)	Considered relevant person under Regulation 11A (1) (a)	Statutory agency for maritime safety, protection of the marine environment and preventing and combatting ship-sourced pollution in the marine environment in Commonwealth waters. AMSA is a relevant agency when proposed offshore activities may impact on the safe navigation of commercial shipping in Australian waters.
Department of Agriculture, Water and the Environment (DAWE)	Considered relevant person under Regulation 11A (1) (a)	Responsible for implementing Commonwealth policies and programs for protecting and strengthening agriculture, water resources, the environment and Australia's heritage. DAWE is considered a relevant person because of its interest in protected marine fauna and biosecurity matters such as introduction of invasive marine species (IMS) that may be relevant to the activity.
Department of Foreign Affairs and Trade (DFAT)	Considered relevant person under Regulation 11A (1) (a)	Responsible for promoting and protecting Australia's interest internationally. Responsible if the activity poses oil spill risk that could result in impacts to other international jurisdictions.
Department of Industry, Science, Energy and Resources (DISER)	Considered relevant person under Regulation 11A (1) (a)	Statutory authority responsible for providing policy advice on matters relating to exploration, investment, management and development of energy resources.
Director of National Parks (DNP)	Considered relevant person under Regulation 11A (1) (a)	Statutory authority for administration, management and control of Commonwealth Marine Reserves (CMR). Relevant person for: • An activity or part of the activity is within the boundaries of a proclaimed CMR. • Activities proposed to occur outside a reserve that may impact on the values within a CMR. • An environmental incident that occurs in Commonwealth waters surrounding a CMR and may impact on the values within the reserve.
National Offshore Petroleum Title Administrator (NOPTA)	Considered relevant person under Regulation 11A (1) (a)	Responsible for the day-to-day administration of petroleum and greenhouse gas titles in Commonwealth waters in Australia.
State government departments/ agencies		

Stakeholder	Relevance based on OPGGS (E) Regulations	Relevance to the Activity
Department of Biodiversity, Conservation and Attraction (DBCA)	Considered relevant person under Regulation 11A (1) (b)	Responsible for management of State marine parks and reserves and protected marine fauna and flora.
Department of Mines, Industry Regulation and Safety (DMIRS)	Considered relevant person under Regulation 11A (1) (c)	Responsible for the management of offshore petroleum activities in the adjacent State waters.
Department of Transport (DoT)	Considered relevant person under Regulation 11A (1) (b)	Responsible for oil pollution response in State waters. Oil spill modelling for the Activity predicts no impact to State waters from an MDO spill. Consultation between SapuraOMV and DoT comfirmed that further consultation is not required unless there is a risk of a spill impacting State waters.
DPIRD	Considered relevant person under Regulation 11A (1) (b)	Responsible for managing State fisheries.
Commercial fisheries – Commonwealth managed		
Southern Bluefin Tuna Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however consultation with AFMA and WAFIC confirmed that there is no fishing effort in the operational area.
Western Tuna and Billfish Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however consultation with AFMA and WAFIC confirmed that there is no fishing effort in the operational area.
Western Skipjack Fishery	Not considered relevant person under Regulation 11A (1)	Fishery management area overlaps with operational area, however consultation with AFMA and WAFIC confirmed that this fishery is inactive.
Commercial fisheries – State managed		
Abalone Managed Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
Mackerel Managed Fishery (Area 2)	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
Marine Aquarium Fish Managed Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
Onslow Prawn Managed Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
Pearly Oyster Managed Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
Pilbara Demersal Scalefish Fisheries • Pilbara Fish Trawl (Interim) Managed Fishery • Pilbara Trap Managed Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.

Stakeholder	Relevance based on OPGGS (E) Regulations	Relevance to the Activity
• Pilbara Line Fishery		
South West Coast Salmon Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
Specimen Shell Managed Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
West Coast Deep Sea Crustacean Managed Fishery	Not considered relevant person under Regulations 11A (1)	Fishery management area overlaps with operational area, however review of DPIRD FishCube data confirmed that there is no fishing effort in the operational area.
Industry representative bodies		
Australian Petroleum Production & Exploration Association (APPEA)	Considered relevant person under Regulation 11A (1) (e)	Representative body for oil and gas explorers and producers in Australia.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	Considered relevant person under Regulation 11A (1) (e)	Represents the interest of the southern blue fin tuna industry.
Commonwealth Fisheries Association (CFA)	Considered relevant person under Regulation 11A (1) (e)	Representative body for Commonwealth fisheries. The operational area intersects with management areas for Commonwealth Managed Fisheries.
Pearl Producers Association (PPA)	Considered relevant person under Regulation 11A (1) (e)	Peak representative organisation of the Australian South Sea Pearling Industry.
Recfishwest	Not considered relevant person under Regulation 11A (1)	Represents the interest of recreational fishers in WA. No recreational fishing likely to take place in the operational area given the distance from shore.
Tuna Australia	Considered relevant person under Regulation 11A (1) (e)	Represents the interest of western tuna and billfish fishery.
Western Australian Fishing Industry Council (WAFIC)	Considered relevant person under Regulation 11A (1) (e)	Represents the interest of commercial fishers with licences to fish in State waters.
Adjacent permit operators		
BP Developments Australia Pty Ltd (BP)	Considered relevant person under Regulation 11A (1) (d)	Operator for permit WA-359-P.
Mobil Australia Resources Company Pty Ltd (Mobil)	Considered relevant person under Regulation 11A (1) (d)	Operator for permit WA-17-L.
Woodside Energy Limited (Woodside)	Considered relevant person under Regulation 11A (1) (d)	Operator for permit WA-28-P, WA-53-L and WA-16-L.
Other interested parties		
Charter Boat Operators	Not considered relevant person under Regulation 11A (1)	Given the distance of the operational area from shore, charter boats are not likely to be present or active in the operational area.
Conservation Council WA	Not considered relevant person under Regulation 11A (1)	Projects of concern are those occurring on land in WA and in State waters only.
International Fund for Animal Welfare (IFAW)	Considered relevant person under Regulation 11A (1) (e)	Actively involved in marine conservation and research projects including reducing impacts of noise from oil and gas operations on marine life.
The Wilderness Society	Considered relevant person under Regulation 11A (1) (e)	Actively involved in the protection of the Kimberley region.

Stakeholder	Relevance based on OPGGS (E) Regulations	Relevance to the Activity
Ningaloo Coast World Heritage Advisory Committee (NCWHAC)	Not considered relevant person under Regulation 11A (1)	The Activity will not have any impacts on the Ningaloo Coast World Heritage Area.

5.4 Consultation Method

The consultation program developed as part of this EP has included provision of project information to, and seeking to enter into a dialogue with, all relevant stakeholders, to identify and understand how the proposed activity may impact on their interests and to gain feedback and input to the EP on the potential impacts and risks. The consultation program for this EP is as follows:

- Introductory project communications (including the Kanga-1 Project Fact Sheet – January 2020 and covering letter or email as appropriate) sent on 28 January 2020 to stakeholders initially identified through the stakeholder identification process. The communication materials sent out during this consultation included an overview of the proposed drilling activity and an indication of a site-survey which will take place prior to drilling.
- A follow-up project communication email (including the Kanga-1 Project Fact Sheet – April 2020) sent on 21 April 2020 to stakeholders initially identified in January 2020 and a few additional stakeholders identified as relevant to be consulted. The communication materials sent out during this consultation was focused on the proposed pre-drilling site survey, providing additional detail of the survey activities and associated impacts/risks and proposed management identified by the project ENVID.
- Stakeholders were encouraged to provide feedback via a dedicated project email and contact number provided. Consideration was given to all responses and feedback from stakeholders received prior to submission of the EP, with the provision of additional or clarifying information to stakeholders as needed.

The communications materials developed for the project, including the fact sheets, covering letters and emails, are presented in **Appendix D** and include:

- A summary of the background to the activity, including SapuraOMV's role and the EP process.
- The location of the activity.
- A summary of the proposed activity, including anticipated timing and duration.
- A summary of the key environmental considerations and the key management measures that SapuraOMV propose to put in place to minimise the potential impacts and risks.
- Contact details to facilitate providing input and feedback, and to obtain further information.

All records of consultation with stakeholders are maintained by SapuraOMV in a stakeholder register.

5.5 Reasonable Time

To ensure relevant persons or organisations were allowed adequate opportunity to consider the information provided, the first fact sheet was sent out in January 2020 allowing over five months for relevant persons or organisations to respond prior to submission of the EP. All responses from stakeholders were immediately responded to. A follow up factsheet was provided approximately six weeks prior to submission of the EP, and again any feedback responded to immediately. Several relevant persons or organisations did not reply to consultation attempts or replied only to acknowledge receipt of the project fact sheet(s) with no feedback on the activity. Follow up emails and/or phone calls to select stakeholders were undertaken to confirm receipt of fact sheets and/or encourage responses to information provided. SapuraOMV considers that a reasonable time period for consultation has been provided to all relevant persons or organisations.

5.6 Managing Relevant Matters, Objections and Claims

During the stakeholder consultation process, all correspondence received from stakeholders was assessed by SapuraOMV for information that may be relevant to the activity, or for objections or claims that may be of merit. The following categories are used in the assessment of merit/ relevance of objections or claims:

- Objection or claims with merit – An objection or claim raised that is relevant to both the planned activity and the stakeholders function, activities or interest. The matter is considered to be of merit if there is a reasonable/ scientific basis for related effects or impacts likely to occur and/ or there is reasonable basis for the matter to be addressed in the EP.
- Objection or claims without merit – An objection or claim raised that may be relevant to the planned activity or the stakeholders function, activities or interest, but with no credible or scientific basis.
- Relevant matter – A matter raised that does not fit the description for claims or concerns with/ without merit. However it is considered a matter relevant to the planned activity and comprises a request to SapuraOMV for further relevant information, or provides SapuraOMV with information that may be relevant to the activity or the EP.
- Irrelevant matter – A matter raised that does not relate to the planned activity or the stakeholder's function, interest or activities being affected by the activity. Irrelevant matters may also be general with no specific issues.

Relevant matters, objections or claims with merit are addressed by SapuraOMV in this EP. SapuraOMV also responded to all objection and claims via email and advised the stakeholder of how any issue raised was addressed in the EP. Stakeholders were also encouraged to provide further feedback and comments on the activity.

5.7 Consultation Results

A summary of all consultation undertaken with relevant persons or organisations, and the full assessment of relevance and merit of any feedback, are provided in **Table 5-2**. The actual record of correspondence is provided in a 'Sensitive Matters Report' that is submitted to NOPSEMA separate to this EP.

Table 5-2 Consultation summary for the Activity

Stakeholder	Summary of stakeholder and titleholder correspondence, and any objections and claims made	Assessment of stakeholder objections and claims
Commonwealth government departments/agencies		
AFMA	AFMA was contacted on 15 January 2020 with details on the activity and operational area and enquiry if the following fisheries that overlap the operational area was active: • Southern Bluefin Tuna Fishery • Western Tuna and Billfish Fishery • Western Skipjack Fishery AFMA responded on 29 January 2020 confirming that there has been no active fishing in the operational area in the last 12 months. AFMA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. AFMA was provided the Kanga-1 Project Fact Sheet - April 2020 via email on 21 April 2020. AFMA responded on 22 April 2020 suggesting SapuraOMV consults with fishers licenced to fish in the operational area either directly or via relevant fishing industry associations. SapuraOMV responded on 5 May 2020 confirming that the relevant fishing industry associations have been contacted. AFMA was contacted on 1 May 2020 to enquire if there has been any fishing in the operational area in the last 5 years. AFMA responded on 8 May 2020 advising that there has been no fishing activity in the opearational area in the last 5 years.	Relevant matter – considered when deciding the level of consultation required for Commonwealth Fisheries. SapuraOMV consulted with relevant fishing industry associations. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
AHO	AHO was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. AHO acknowledged receipt of information on 7 February 2020. AHO was provided the Kanga-1 Project Fact Sheet - April 2020 via email on 21 April 2020. AHO acknowledged receipt of information on 22 April 2020.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
AMSA	AMSA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. AMSA responded on 29 January 2020 advising: • The Master should notify AMSA's Joint Rescue Coordination Centre (JRCC) for promulgation of radio-navigation warnings at least 24-48 hours before operations commence. JRCC will also need to be advised when operations start and end. • SapuraOMV should contact the AHO at no less than four working weeks before operations, with details relevant to the operations. The AHO will promulgate the appropriate Notice to Mariners (NTM), which will ensure other vessels are informed of activities. • To obtain a vessel traffic plot showing Automatic Identification System (AIS) traffic data for the area of interest, please visit AMSA's spatial data gateway and Spatial@AMSA portal to download digital data sets and maps. AMSA was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020.	Relevant matter – AMSA notification included in **Section 7.1** of the EP. Vessel traffic map presented in **Figure 4-14**.
DAWE	DAWE was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will

<table>
<tr><th>Stakeholder</th><th>Summary of stakeholder and titleholder correspondence, and any objections and claims made</th><th>Assessment of stakeholder objections and claims</th></tr>
<tr><td></td><td>DAWE was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020.
No response received to date.</td><td>address any comments from this stakeholder should they arise in the future.</td></tr>
<tr><td>DFAT</td><td>DFAT was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020.
DFAT was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020.
No response received to date.</td><td>No objections/ claims with merit raised.
SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.</td></tr>
<tr><td>DISER</td><td>DISER was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020.
DISER was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020.
No response received to date.</td><td>No objections/ claims with merit raised.
SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.</td></tr>
<tr><td>DNP</td><td>DNP was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020.
DNP responded on 2 February 2020 advising that the planned activities do not overlap any Australian marine parks and therefore there are no authorisation requirements from DNP. To assist in the preparation of an EP for petroleum activities that may affect Australian marine parks, NOPSEMA and Parks Australia have developed and published a guidance note that outlines items to consider and evaluate. In preparing the EP, SapuraOMV is to consider the Australian marine parks and their representativeness. SapuraOMV is to ensure that the EP:
• Identifies and manages all impacts and risks on Australian marine park values (including ecosystem values) to an acceptable level and considers all options to avoid or reduce them to ALARP.
• Clearly demonstrates that the activity will not be inconsistent with the management plan.
DNP advised that:
• The Northwest Marine Parks Network Management Plan 2018 came into effect on 1 July 2018 and provides further information on values for Cartier Island, Ashmore Reef and Kimberley marine parks.
• Australian marine park values are defined into four categories: natural (including ecosystems), cultural, heritage and socio-economic.
• Information on the values for marine parks is located on the Australian Marine Parks Science Atlas.
DNP confirmed that no further notification of progress made in relation to the Activity was required unless details regarding the activity changes and results in an overlap with or new impact to a marine park, or for emergency response.
In regards to emergency response, DNP advised:
• They should be made aware of oil/ gas pollution incidences that occur within a marine park or are likely to impact on a marine park as soon as possible.
• Notification should be provided to the 24 hour Marine Compliance Duty Officer and should include:
– Titleholder details.
– Time and location of the incident (including name of marine park likely to be affected).</td><td>Relevant matter – Australian marine parks and Management Plans relevant to the activity are discussed in Section of the EP.</td></tr>
</table>

Stakeholder	Summary of stakeholder and titleholder correspondence, and any objections and claims made	Assessment of stakeholder objections and claims
	– Proposed response arrangements as per the Oil Pollution Emergency Plan (eg. dispersant, containment, etc.). – Confirmation of providing access to relevant monitoring and evaluation reports when available. – Contact details for response coordinator. SapuraOMV responded on 12 March 2020 thanking the DNP for confirming that no authorisation from the DNP is required to undertake the activity. And no further notification of progress made in relation to the activity is required, unless there is a change to the activity that would result in an overlap with, or new impacts to a marine park or for emergency response purposes. DNP was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. • DNP responded on 15 May 2020 in the same manner as 2 February 2020 with the additional comments: The Northwest Marine Parks Network Management Plan 2018 came into effect on 1 July 2018 and provides further information on values for Montebello Marine Park. SapuraOMV responded to thank DNP for providing the feedback on 18 May 2020.	
NOPTA	NOPTA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. NOPTA was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
State government departments/agencies		
DBCA	DBCA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. DBCA responded on 3 February 2020 advising that DBCA has no comments in relation to its responsibilities under the *Biodiversity Conservation Act 2016* and the *Conservation and Land Management Act 1984*. DBCA advised SapuraOMV to continue to provide notifications to them. DBCA was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. SapuraOMV contacted the DBCA on 26 May 2020 via telephone to enquire if the DBCA had comments/ feedback about the Kanga-1 activity based on the latest fact sheet. DBCA advised that they typically only respond to the the first email from an operator and provide their comments/ feedback then. Follow-up emails or subsequent provision of information from an operator will usually not be responded to unless the DBCA wanted to raise a matter that was not raised in the intial email from them.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
DMIRS	DMIRS was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. DMIRS was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
DoT	DoT was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. DoT responded on 5 February 2020 advising that if there is a risk of a spill impacting State waters, the DoT is to be consulted as outlined in the DoT Offshore Petroleum Industry Guidance Note –	SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.

Stakeholder	Summary of stakeholder and titleholder correspondence, and any objections and claims made	Assessment of stakeholder objections and claims
	Marine Oil Pollution: Response and Consultation Arrangements (September 2018). DoT was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. DoT responded on 4 May 2020 advising they had no further comments than was already provided in February 2020. DoT confirmed via telephone on 15 May 2020 that no consultation is required for the Kanga-1 G&G Site Survey OPEP as there is no risk of the a spill impacting State waters. This was followed up with an email on 27 May 2020.	
DPIRD	DPIRD was contacted on 14 January 2020 to request FishCube data for 2015-2019. DPIRD responded on 15 January 2020 advising the following: • Data for 2019 is yet to be finalised and therefore DPIRD proposed providing FishCube data for 2014 – 2018 instead. • The data requested is quite specific (5 x 5 NM blocks and by the month). This will result in a lot of confidential data on weight of fish caught as the number of vessels active in the area per month is very low. DPIRD proposed providing data for the whole 5 years instead. • There isn't any activity in the two 5 x 5 NM blocks selected but some fisheries are active within the 60 x 60 NM blocks. It seems like the operational area is closed to fishing and therefore it is very unlikely for any fishing activities to occur there. SapuraOMV responded to DPIRD on 15 January 2020 advising: • Data from 2014 to 2018 was acceptable given 2019 data was yet to be finalised. • Yearly (instead of monthly) data is sufficient. • If the area is closed for fishing does that mean that there is no data for the area requested? DPIRD responded on 15 January 2020 advising that they have no recorded commercial or tour operator fishing activity in the 5 x 5 NM blocks where the operational area is located for years 2014 – 2018. DPIRD was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. DPIRD was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. SapuraOMV followed up with DPIRD on 21 April 2020 to enquire if the 2019 fisheries data is available. DPIRD responded on 8 May 2020 advising that FishCube has been refreshed with 2019 commercial data. SapuraOMV responded on 8 May 2020 enquiring if there has been any fishing activity in the operational area in 2019. DPIRD responded on 11 May 2020 advising that they have no records of commercial or tour operator fishing activity in the operational area for the year 2019.	Relevant matter – considered when deciding if State fishers needed to be consulted. The absence of fishing in the operational area was discussed in **Section 4.7.1.2** of the EP. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
Industry representative bodies		
APPEA	APPEA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. APPEA was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.

Stakeholder	Summary of stakeholder and titleholder correspondence, and any objections and claims made	Assessment of stakeholder objections and claims
ASBTIA	ASBTIA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. ASBTIA was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. SapuraOMV contacted ASBTIA on 29 April 2020 via telephone to enquire if they represented the Western Tuna and Billfish Fishery, as was suggested by an industry member. ASBTIA advised that Tuna Australia was the relevant association and that the Southern Bluefin Tuna Fishery does not have any activity in the operational area. SapuraOMV contacted ASBTIA on 30 April 2020 via telephone to confirm they had no concerns about the Kanga-1 activity. ASBTIA confirmed that they did not have any concerns and that the Southern Bluefin Tuna Fishery does not have any activity in the operational area. The ASBTIA followed this up with an email on 30 April 2020 and requested that they be removed from the stakeholder list.	No objections/ claims with merit raised. Stakeholder will not be consulted further and will be removed from the stakeholder list for this activity.
CFA	CFA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. CFA was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. SapuraOMV contacted CFA on 1 May 2020 via telephone to enquire if CFA had any concerns about the Kanga-1 activity. CFA confirmed that they did not have any concerns and therefore did not require further consultation on the activity. CFA enquired if SapuraOMV has contacted ASBTIA and Tuna Australia who are fishing industry associations who may have interest in the activity. SapuraOMV confirmed existing consutation with ASBTIA and Tuna Australia. CFA followed this up with an email on 1 May 2020.	Relevant matter – request to consult with ASBTIA and Tuna Australia considered and undertaken. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
PPA	PPA was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. PPA was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
Tuna Australia	SapuraOMV contacted Tuna Australia via email on 29 April 2020 to confirm that they represented the Western Tuna and Billfish Fishery, to introduce the Kanga-1 Project and enquire if there was any planned activity for the WTBF in the operational area. Tuna Australia confirmed they represented the fishery and requested further details so they could discuss any future activity in the area with their members. Tuna Australia was provided with Kanga-1 Project Fact Sheet – January 2020 and Kanga-1 Project Fact Sheet – April 2020 via email on 30 April 2020. Tuna Australia responded that the area presented no issues for the fishery as important grounds are further south. Concern was raised that in the event of a loss of well control during drilling, currents would likely carry a spill south and expose tuna fisheries – requested further detail on how this would be managed. SapuraOMV provided further information and committed to keeping Tuna Australia informed regarding drilling activity.	No objections/ claims with merit regarding the site survey raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future, noting that drilling activities are to be managed via a separate EP.
WAFIC	SapuraOMV contacted WAFIC on 14 April 2020 via email regarding Kanga-1 exploration well. Also advised no commercial fishing activity in the area of interest as advised by AFMA and DPIRD. WAFIC contacted SapuraOMV via telephone shortly after the email was sent to request for a map and copy of correspondence with DPIRD. The information was provided in a follow up email later that afternoon on the 14 April 2020.	Relevant matter – matters raised that are relevant to the site suvey included in **Section 7.1** of the EP. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.

Stakeholder	Summary of stakeholder and titleholder correspondence, and any objections and claims made	Assessment of stakeholder objections and claims
	SapuraOMV contacted WAFIC on 22 April 2020 via email to determine if WAFIC had any comments on Kanga-1. WAFIC advised they were busy with COVID-19 initiatives and will need more time to get back to us. SapuraOMV contacted WAFIC 12 May 2020 to advise that DPIRD confirmed no commercial fishing activity in Kanga-1 operational area. Also advised that CFA requested that they do not require additional consultation for the proposed Kanga activities. WAFIC responded on 13 May 2020 and acknowledged that there was no active State or Commonwealth fisheries in the operational area. WAFIC confirmed that no further consultation is required with the commercial fishing sector. WAFIC requested SapuraOMV's acknowledgement of the following and inclusion in the EP: • No recreational fishing from support/ commercial vessels. • Understanding of the difference between exclusion zones and cautionary zones amongst SapuraOMV's staff, contractors and sub-contractors. • Communication with all staff about portecing the rights of active commercial fishers on the waters. SapuraOMV responded to WAFIC on 15 May 2020 and thanks WAFIC for confirming that no further consultation with the commercial fishing sector is required for the Kanga-1 project. SapuraOMV acknowledged the following: • There will be no recreational fishing from support/ commercial vessels - this will be reinforced in the EP. • SapuraOMV will have the temporary exclusion zones and cautionary zones in place during drilling, per the AHP20 Mariner's Handbook for Australian Waters, Australian Hydrographic Office (April 2020). Commercial fishing is not expected in the operational area so not likely to have any implications to activity. As professional mariners, vessel contractors are aware of the respective requirements. • Interaction with active commercial fishers is not expected in the Kanga operational area. Nevertheless vessels are required to abide by Australian maritime law and AMSA guidelines at all times.	
Adjacent permit operators		
BP	BP was provided the Kanga-1 Project Fact Sheet - April 2020 via email on 21 April 2020. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
Mobil	Mobil was provided the Kanga-1 Project Fact Sheet - April 2020 via email on 21 April 2020. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
Woodside	SapuraOMV received consultation material from Woodside on 27 February 2020 in regards to the Greater Western Flank Phase-3 and Lambert Deep Drilling and Subsea Installation project. SapuraOMV responsed to Woodside on 20 March 2020 to inform them about the upcoming Kanga-1 activities. Woodside was provided the Kanga-1 Project Fact Sheet - April 2020 via email on 21 April 2020.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.

Stakeholder	Summary of stakeholder and titleholder correspondence, and any objections and claims made	Assessment of stakeholder objections and claims
	No response received to date.	
Other interested parties		
IFAW	IFAW was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. IFAW was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. IFAW responded on 24 April 2020 advising that they have no capacity to respond at present and will respond at a later date. SapuraOMV contacted IFAW on 1 May 2020 and 18 May 2020 requesting feedback by 19 May 2020 so that it can be addressed during the EP development. SapuraOMV also advised that comments or feedback received at any time prior to or during the activity are also welcomed and will be duly considered and responded to. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.
The Wilderness Society	The Wilderness Society was provided the Kanga-1 Project Fact Sheet - January 2020 and a cover letter introducing SapuraOMV and the activity via email on 28 January 2020. The Wilderness Society was provided the Kanga-1 Project Fact Sheet – April 2020 via email on 21 April 2020. No response received to date.	No objections/ claims with merit raised. SapuraOMV considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.

5.8 Ongoing Consultation

Ongoing consultation allows for SapuraOMV to maintain a comprehensive view of stakeholder functions, interests and activities, and provide a forum for enquiries, objections and claims by relevant persons in the lead up to and during the conduct of the activity. SapuraOMV has a process for ongoing stakeholder engagement and any concerns raised by stakeholders subsequent to this EP submission will be duly considered and addressed. The following will apply as part of the ongoing consultation process:

- SapuraOMV will maintain a dedicated email address to enable ongoing communication by stakeholders throughout the site survey (kanga.australia@sapura-omv.com).
- SapuraOMV will provide notifications to relevant persons at key project milestones in accordance with **Table 5-3**.
- If SapuraOMV becomes aware of a change in the potential to affect a relevant person or organisation's functions, interests or activities, or the control measures identified in this Environment Plan are found to be less adequate than currently understood, SapuraOMV will contact the relevant person(s) concerned and provide sufficient information regarding the change and provide reasonable time for responses and to address any new concerns that arise.
- If SapuraOMV becomes aware of the potential to affect a relevant person's functions, interests or activities at any time during the survey that was not identified prior to commencing the survey, SapuraOMV will immediately attempt to contact and consult with the relevant person(s).
- If ongoing consultation identifies a significant new environmental impact or risk, or a significant increase in an already identified impact or risk, the Management of Change process will be triggered.

SapuraOMV will provide updates and advise of any material changes to the survey if they arise as planning and implementation processes progress.Notifications/consultations required for this activity are outlined in **Table 5-3**.

Table 5-3 Notifications/consultations required for the activity

Stakeholder	Purpose of Notification/ Consultation	Notification/ Consultation Method	Timing
AMSA	Notify AMSA's Joint Rescue Coordination Centre (JRCC) prior to commencement of the Activity with vessel details (name, callsign and Maritime Mobile Service Identity (MMSI)), satellite communication details (including INMARSAT-C and satellite telephone), area of operation and requested clearance required from other vessels, and Activity start and end date to allow promulgation of radio-navigation warnings.	Email to: rccaus@amsa.gov.au Phone: 1800 641 792/ +612 6230 6811	Within 24 – 48 hours prior to commencement the Activity.
	Advise AMSA's JRCC at completion of the Activity.	Email to: rccaus@amsa.gov.au	Immediately following completion of the Activity.
AHO	Notify AHO prior to commencement of the Activity to allow promulgation of related Notices to Mariners.	Email to: datacentre@hydro.gov.au	At least 4 working weeks prior to commencement of the Activity.
DMIRS	Notify DMIRS prior to commencement and after cessation of the activity.	Email to: petroleum.environment @dmirs.wa.gov.au	Approximately 1 week prior to commencement date

Stakeholder	Purpose of Notification/ Consultation	Notification/ Consultation Method	Timing
			and within 1 week after cessation of activity.
NOPSEMA	Notify NOPSEMA of activity commencement and completion, using Regulation 29 – Start or end of an activity notification form available at: https://www.nopsema.gov.au/environmental management/notification-and-reporting/ Notify NOPSEMA of the end of operation of the EP, using Regulation 25A – End of operation of environment plan notification from available at: https://www.nopsema.gov.au/environmental management/notification-and-reporting/	Email to: submissions@nopsema.gov.au	At least 10 days prior to commencement and within 10 days of completion.

6. Environmental Impact and Risk Assessment

In accordance with Regulation 13(5) of the OPGGS (E) Regulations 2009, an environmental risk assessment was undertaken to evaluate impacts and risks arising from the activities described in **Section 3**. This section describes the process undertaken by SapuraOMV to identify, assess and manage all potential environmental impacts and risks associated with the Kanga-1 geophysical and geotechnical site survey from planned activities and from unplanned events.

The impact and risk assessment process takes account of the nature and scale of the activity, and all potential environmental impacts that may or will occur directly or indirectly from planned activites (routine) and from unplanned events. In addition, the process demonstrates how the introduction of appropriate control and management measures will effectively manage potential impacts and risks to ALARP and acceptable levels.

The outcomes of the assessment are presented in **Section 7** for planned activities, and **Section 8** for unplanned events.

6.1 Assessment Methodology

SapuraOMV's HSE Management System (HSE-MM-MAN-0001) and Risk Management Procedure (AU-HS-PRO-001-1.0) sets out the process for a consistent and repeatable approach to risk management to ensure all hazards and risks associated with operations and project implementation activities are identified, evaluated, managed, documented and closed out in a safe, practical and effective manner. Fundamental to the risk management process is that all risks must be managed to ALARP, and an acceptable level.

The impact and risk assessment process applied to this EP is consistent with the requirements of the *Australian Standards ISO 31000:2018 Risk Management – Guidelines*, and the *AS/NZS Handbook 203: 2012 Managing Environment-Related Risk*. The key steps used for the risk assessment process are shown in **Figure 6-1** and described further in **Section 6.3**.

6.2 Assessment Process

SapuraOMV has followed the process in **Figure 6-1** for the environmental impact and risk assessment, through the following key steps:

- Establishing the context, taking into account:
  - The description of the activity (**Section 3**), including the nature and scale of the activity.
  - The relevant corporate policies, standards and systems (**Sections 2** and **9**).
  - The relevant legislation/guidance/guidelines, including species action plans and marine reserve management plans (**Sections 2, 4** and **Appendix B**).
  - The existing environment (physical, biological and socio-economic) considering the environmental values/receptors/sensitivities/attributes in the environment that will, or may be affected directly or indirectly by the activity, including potential emergency conditions, whether resulting from accident or any other cause (**Section 4**).
  - The stakeholder context obtained from appropriate consultation with relevant authorities and other relevant interested persons or organisations (**Section 5**).
- Identification of hazards/risks associated with the activity.
- Identification of the existing control measures in place.

- Assessment of the impact/risk with existing control measures in place to determine the inherent risk.
- Identification and consideration of potential additional control measures to reduce the impacts and risks to ALARP and acceptable levels.
- Assessment of impacts and risks with any additional control measures in place to determine the residual risk and evaluation if the risk has been reduced to ALARP and is acceptable.
- Application of further additional control measures if needed.

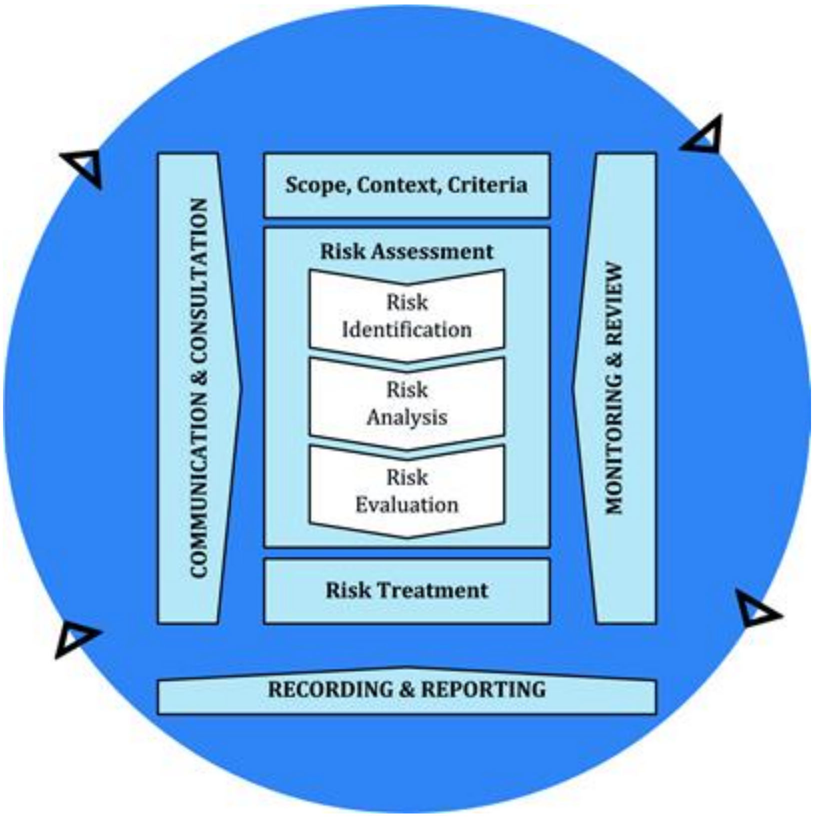


Figure 6-1 Risk management process

Source: AS ISO 31000: 2018 Risk Management – Guidelines

6.3 Impact and Risk Identification

An environmental impact identification (ENVID) workshop was held on 9 April 2020. The ENVID workshop was attended by personnel from different technical disciplines including SapuraOMV's HSE and Drilling Departments, and specialist environmental consultants.

The aim of the workshop was to identify hazards/risks associated with the activity, identify controls and management measures to treat the impacts and risks, and to assign a level of risk based on the consequence (severity) of the impact/risk and the probability of the consequence occurring (the likelihood). The outcomes of the workshop and agreed actions were recorded.

6.3.1 Determination of Consequence Severity

Once the potential hazards/risks and environmental receptors are identified, the potential level of impact (consequence) is assessed and assigned a rating. Consequence is defined using the SapuraOMV Consequence Severity Classification (**Table 6-1**), based on the SapuraOMV Risk Matrix.

Table 6-1 SapuraOMV severity of consequence classification

Consequence Classification	Indicative Impact				
	Health and Safety	**Security**	**Natural Environment**	**Reputation/ Govt. / Community/ Media**	**Financial (USD)**
Critical (V)	Fatality	Massive effect. Disastrous consequences: long-term disruption to rule of law, general disorder, extensive property damage, severe impact on SEP operations and / or local community, may require international assistance.	Destruction of sensitive environmental features. Severe impact on ecosystem. Very long (or permanent) term impacts (restitution time >10 years) on populations (global or national), ecosystems or environmentally sensitive areas of international or national importance. Very long (or permanent) term impacts (restitution time >10 years) on populations (regional), ecosystems or environmentally sensitive areas of regional importance. Regulatory & high level Government intervention/action.	Critical impact on business reputation /or international media exposure.	Financial loss in excess of 25 million.
Major (IV)	Permanent disabling injury and/or long term off work.	Major effect. Serious consequences: medium-term disruption to rule of law, general disorder, property damage, impact on SEP operations and / or local community, may require state assistance.	Long-term impact (restitution time 1-10 years) on populations (regional and national significance), ecosystem and sensitive environmental features (e.g. wetlands) of national and regional importance. Likely to result in regulatory intervention/action.	Significant impact on business reputation and/or national media exposure.	Financial loss from >20 million to 25 million.
Moderate (III)	Injury requiring medical treatment, time off work or rehabilitation.	Localised effect. Significant consequences: short to medium-term disruption to law and order, short-term impact on local community, property damage.	Short-term impact (restitution time <1 year) on sensitive environmental features (e.g. hatchery/spawning ground) of national or regional importance, populations (national or regional) and ecosystems. Medium term impacts (restitution time 1-3 years) on populations (local), ecosystems or environmentally sensitive areas of local importance. Triggers regulatory investigation.	Moderate to small impact on business reputation.	Financial loss from >10 million to 20 million.
Minor (II)	Injury requiring medical treatment with no lost time.	Minor effect. Some consequences: short-term disruption to law and order, no impact on local community, on property damage.	Short-term impact (restitution time <1 year) on fauna, flora, habitat, populations (local) or environmentally sensitive areas of local importance but no negative effects on ecosystem. Requires immediate regulator notification.	Some impact on business reputation.	Financial loss from 25,000 to 10 million.
Negligible (I)	Minor injury - first aid treatment.	Slight effect. Few consequences: inconvenience through disruption to legal process, no impact on local community or environment.	Temporary impact (restitution time days to weeks) on fauna/flora, habitat, aquatic ecosystem or water resources. No measurable impact to local populations, ecosystems or environmentally sensitive areas of local importance. Localised, temporary impact to individual organisms. Incident reporting according to routine protocols.	Minimal impact to reputation.	Financial loss from 0 to <25,000.
Definitions					
Duration of Potential Impact	Short-term: Days or weeks. Medium-term: Less than 12 months. Long-term: Greater than 12 months.				

6.3.2 Determination of Likelihood

Likelihood is defined as the chance or frequency of the consequence occurring. The likelihood accounts for the effective implementation of selected control measures. Likelihood is defined with the SapuraOMV Likelihood Descriptors (**Table 6-2**), based on the SapuraOMV Risk Matrix.

Table 6-2 SapuraOMV likelihood descriptors

Likelihood Classification		Criteria
Almost Certain	A	Consequence is expected to occur in most circumstances. (Occurs about once weekly or more; or around 50 times per year).
Likely	B	Consequence could occur in most circumstances. (Occurs once about monthly; or around 12 times per year).
Possible	C	Consequence has occurred here or elsewhere. (Occurs once yearly).
Unlikely	D	Consequence hasn't occurred here but could. (Occurs once or more in 10 years).
Remote	E	Consequence is extremely unlikely, or never occurred before in industry.

6.4 Impact and Risk Assessment

The environmental impacts and risks for planned activities (routine) and unplanned events (accidents/incidents) of the proposed activity covered by this EP were assessed using the SapuraOMV Risk Matrix (**Table 6-3**). The risk assessment matrix is based on the consequence: the severity of the impact or the extent of damage caused by the occurrence of the hazard (see **Section 6.3.1**), and the likelihood: the probability of a consequence occurring (see **Section 6.3.2**).

Inherent risk levels were determined based on standard management and control measures in place (i.e. legislation, industry standards and codes). Risk levels were determined in accordance with the SapuraOMV Risk Matrix (**Table 6-3**).

Table 6-3 SapuraOMV risk matrix

			Consequence Severity				
			Negligible	**Minor**	**Moderate**	**Major**	**Critical**
			I	**II**	**III**	**IV**	**V**
Likelihood	**Almost Certain**	**A**	3 (Medium)	3 (Medium)	4 (High)	5 (Unacceptable)	5 (Unacceptable)
	Likely	**B**	2 (Low)	3 (Medium)	3 (Medium)	4 (High)	5 (Unacceptable)
	Possible	**C**	2 (Low)	2 (Low)	3 (Medium)	3 (Medium)	4 (High)
	Unlikely	**D**	1 (Very Low)	2 (Low)	2 (Low)	3 (Medium)	3 (Medium)
	Remote	**E**	1 (Very Low)	1 (Very Low)	2 (Low)	2 (Low)	3 (Medium)

Information used to inform the impact and risk assessment included:

- Proposed survey details including equipment, proposed location, timing of the activity and impacts (e.g. seabed disturbance) (see **Section 3**);
- An understanding of the general vessel operations during the activity and the nature and scale of potential impacts and the possible threats to environmental receptors (physical, biological and socio-economic) (see **Section 4**);

- Review of the available information, including scientific literature, on the environmental sensitivities in the receiving environment (see **Section 4**);
- Modelling of the trajectory and fate of spilled hydrocarbons (**Section 8.1**); and
- Information from relevant stakeholders obtained during consultation on how their functions, interest and activities may be affected by the proposed activity (see **Section 5**).

6.5 Control Measures, Environmental Performance Outcomes, Standards and Measurement Criteria

For each planned activity and unplanned event, a set of control measures, environmental performance outcomes (EPOs), environmental performance standards (EPSs) and measurement criteria are identified. These were used to address potential environmental impacts and risks identified during the risk assessment.

Each term is defined as:

- **Control measure:** a system, an item of equipment, a person or a procedure that is used as a basis for managing environmental impacts and risks.
- **Performance outcome:** a measurable level of performance required for the management of environmental aspects of an activity to ensure that the environmental impacts and risk will be of an acceptable level.
- **Performance standard:** a statement of the performance required of a control measure.
- **Measurement criteria:** defines how environmental performance will be measured and determine whether the outcomes and standards have been met.

6.6 Demonstration of ALARP

6.6.1 ALARP Decision Framework

During the impact and risk assessment, appropriate controls and mitigation measures for each hazard/ risk were identified through relevant legislation, guidelines, codes and standards, together with professional judgement and experience of participants of the ENVID workshop.

A hierarchy of controls was applied in order to reduce the potential for the identified hazards/risks to be realised, or if realised, reduce the consequence. Control measures were applied to eliminate the hazards/risks, or if this is not reasonably practicable, to minimise the impacts and risks to ALARP. **Table 6-4** presents the hierarchy of control measures in order of preference for hazard/risk control (i.e. the most effective measure is to eliminate the hazard/risk completely and the least effective is to ‘manage’ the hazard/risk with personal protective equipment).

Table 6-4 Hierarchy of control measures

Control	Description
Elimination	Remove the risk or hazard completely.
Substitution	Change the risk for a lower one (e.g. replace a hazardous substance with one which is less hazardous).
Isolation	Isolate people, equipment or the environment from the risk.
Engineering	Engineer out the risk; redesign the procedures, process or equipment (e.g. re-route the source of discharge to a closed drain system).
Administrative	Implement a process or administrative procedure; or provide instruction or training to personnel to reduce the risk.
Protective	Use of protective equipment (e.g. the use of vapour masks).

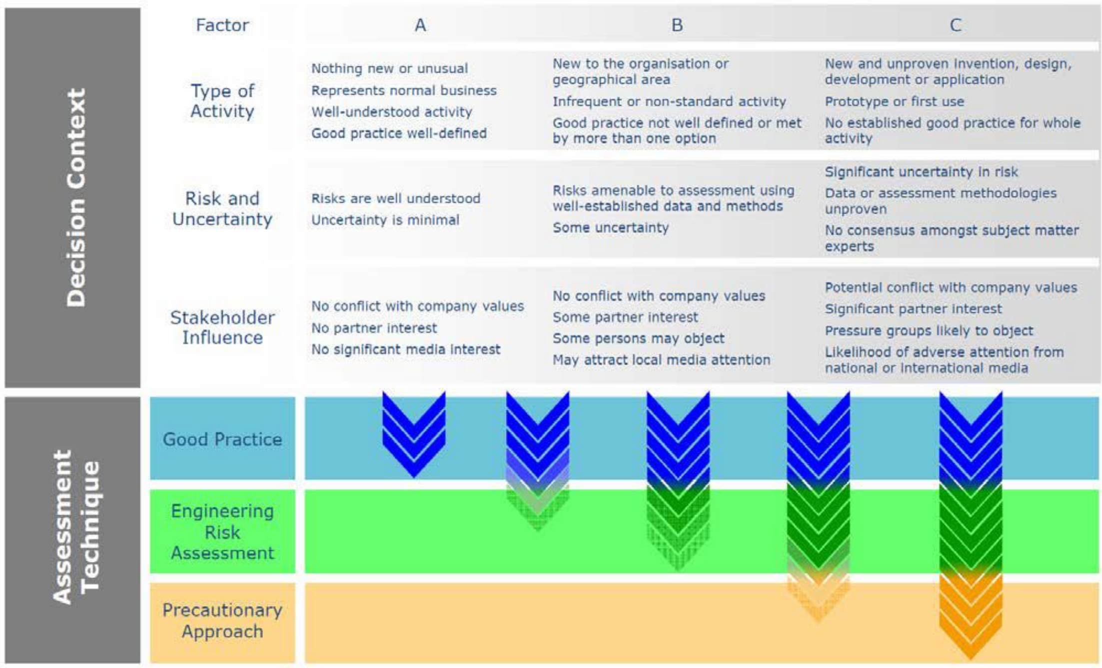
6.6.2 ALARP Decision Context

In alignment with NOPSEMA's ALARP Guidance Note (NOPSEMA, 2015), and in addition to SapuraOMV's HSE Management System (HSE-MM-MAN-0001) and Risk Management Procedure (AU-HS-PRO-001-1.0), SapuraOMV have adopted the framework developed by Oil and Gas UK (OGUK) (OGUK, 2014) to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP (**Figure 6-2**). Specifically, the framework provides guidance on the factors that may affect the decision context relating to:

- Type of activity;
- Risk and uncertainty; and
- Stakeholder influence.

This framework provides appropriate tools, commensurate to the level of uncertainty or novelty associated with the impact or risk (referred to as the Decision Type A, B or C). Decision types and methodologies to establish ALARP are as follows:

- **Context A decisions –** where the risks are relatively well understood, the potential impacts are low, activities are established practice and there is no significant stakeholder interest. In cases where good practice may not be sufficiently well-defined, engineering risk assessment may be required to further guide the decision.
- **Context B decisions –** where there is greater uncertainty or complexity around the activity and/or risk, the potential impact is moderate or being undertaken in areas of increased environmental sensitivity, and the activity/risk is generating some concerns from stakeholders. In this instance established good practice is not considered sufficient, and further assessment is required to support the decision and ensure that the risk is ALARP.
- **Context C decisions –** typically involve sufficient complexity, high potential impact, uncertainty or stakeholder interest to require a precautionary approach. In this case, relevant good practice will still have to be met, additional assessment will be required, and the precautionary approach applied.



Source: Oil & Gas UK (2014)

Figure 6-2 Impact and risk-related decision-making framework

6.7 Residual Impact and Risk

Where additional controls are identified that might reduce impacts, the residual risk is then evaluated and ranked. This iterative risk evaluation process is employed until such time as any further reduction in the residual risk is not reasonably practicable to implement (i.e.cost is grossly disproportionate to the environmental benefit gained). At this point, the impact or risk is reduced to ALARP.

SapuraOMV requires further detailed review and management consideration of any residual risk ranking above 3 (**Table 6-3).** Further, a residual risk ranking of 5 is considered to be intolerable.

6.8 Demonstration of Acceptability

The model used for determining acceptance of residual risk is provided in **Figure 6-3**. Potential environmental impacts and risks are only deemed acceptable once all reasonably practicable alternatives and additional measures have been taken to reduce the potential impacts and risks to ALARP.

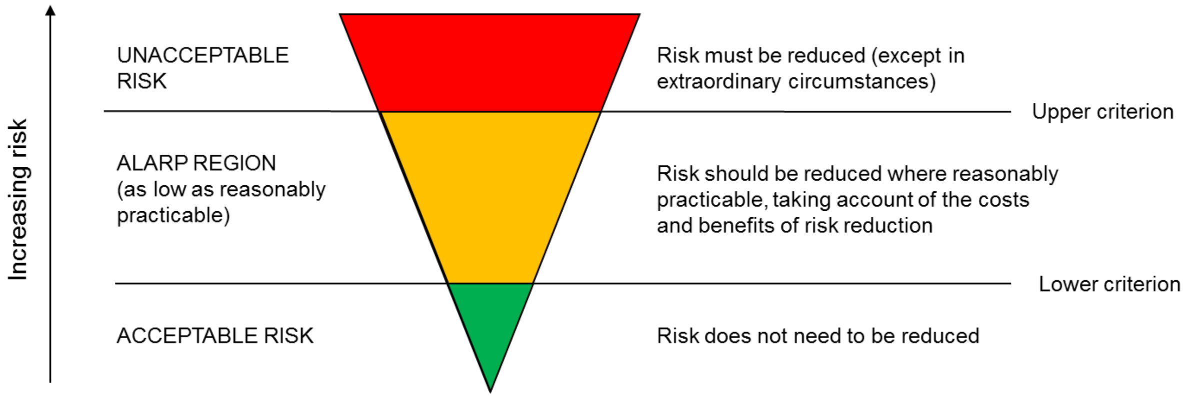


Figure 6-3 Residual risk acceptance model

SapuraOMV considers a range of factors when evaluating the acceptability of environmental impacts or risks associated with the activity. This is based on NOPSEMA's Guidance Note – Environment Plan Content Requirements Rev 4 (NOPSEMA, 2019c). To evaluate the acceptable level of impacts and risks in **Sections 7** and **8**, the following were considered by SapuraOMV:

- Environmental impacts and risks are reduced to ALARP, and residual risk determined to be between very low (1) and medium (3);
- Principles of Ecological Sustainable Development (ESD):
  - Decision-making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations;
  - If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
  - The principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations; and
  - The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.

- Legislative and other requirements (e.g. laws, policies, standards, conventions, statutory instruments such as recovery plans for threatened species, plans of management for protected places).
- Internal context – SapuraOMV policies, standards and procedures have been identified and implemented.
- External context – societal values and relevant stakeholder objections and claims have been considered and addressed.

Acceptable levels are evaluated independently of the ALARP process and acceptability criteria are considered when selecting EPOs that apply to managing a particular impact or risk.

7. Environmental Assessment for Planned Activities

This Section provides a description and evaluation of the environmental impacts and risks for planned (routine) activities using the methodology described in **Section 6**. During the ENVID six hazards specifically associated with planned activities were identified. A summary of the risk ratings determined for each aspect/hazard is provided in **Table 7-1**. **Sections 7.1** to **7.6** provide a detailed description and evaluation of the environmental impacts and risks from planned activities.

Table 7-1 Summary of risk assessment ranking for planned activities

Hazard	Consequence	Likelihood	Residual Risk
Section 7.1 – Physical Presence – Interference with Other Marine Users			
Timing and location of the activity; physical presence of the survey vessel on site.	I (Negligible)	C (Possible)	2 (Low)
Section 7.2 – Physical Presence – Seabed Disturbance			
Vessel anchoring (if required), geotechnical survey (box coring, vibracoring etc).	I (Negligible)	C (Possible)	2 (Low)
Section 7.3 – Light Emissions			
Artificial lighting on vessel. Underwater lighting associated with ROV operations (if required).	I (Negligible)	D (Unlikely)	1 (Very Low)
Section 7.4 – Noise Emissions			
Underwater noise generated from operation of vessel (engine, propeller noise, machinery noise).	I (Negligible)	C (Possible)	2 (Low)
Underwater noise generated from geophysical investigations (SSS, MBES, SBP).	II (Minor)	D (Unlikely)	2 (Low)
Section 7.5 – Atmospheric Emissions			
Fuel combustion (marine diesel) to power the vessel and operate machinery.	I (Negligible)	D (Unlikely)	1 (Very Low)
Section 7.6 – Routine Discharges			
Discharge of liquid wastes (sewage, bilge water, cooling water, grey water, oily water and deck drainage) as part of routine vessel operations.	I (Negligible)	B (Likely)	2 (Low)

7.1 Physical Presence – Interference with Other Marine Users

Planned Activity
The following activities were identified as having the potential to result in interaction with other marine users: • Timing and location of the activity; and • Physical presence and movement of the survey vessel.
Hazard Identification
The physical presence of the survey vessel has the potential to cause disruption or displacement of other marine users, including shipping, fisheries, and offshore petroleum support vessels in the area. One vessel will be onsite at any given time to complete survey activities. The site survey is expected to take up to ~14 days (excluding weather and operational delays), and the vessel will operate on a 24-hour/day basis for the duration of the activity.
Environmental Impact Assessment
The physical presence of the survey vessel has the potential to impact: • Shipping; and • Commercial and recreational fisheries. Three Commonwealth and 11 State managed fisheries overlap the operational area (**Section 4.7.1**). Potential impacts to commercial fisheries are a very short-term / temporary loss of access to fishing grounds when the survey vessel is in the operational area, which may potentially result in reduced catches and income with insufficient management. An analysis of the current fishery closures, historical fishing effort data, fishing methods and consultation feedback (**Section 5**) has revealed that commercial fishing in the operational area is not expected (**Section 4.7.1**) As such, the activity is expected to have negligible impact on commercial fishing operations. Tourism and recreational activities are not expected to occur in the operational area given the water depths, lack of seabed features and distance from the mainland. Consequently, impacts to tourism or recreation from planned activities are not expected. There are no recognised shipping routes in or near the operational area with the nearest designated shipping fairway approximately 48 km to the east (**Figure 4-14**). Automatic Identification System (AIS) data from the Australian Maritime Safety Authority (AMSA) indicates that vessel traffic, mainly from offshore petroleum support vessels and local traffic may be encountered in the operational area, but the level of shipping traffic is expected to be low (**Figure 4-14**).

The site survey will occur over a relatively short duration of time (~14 days in total) and the area affected represents only a very small portion of the available area for other vessels to move through. The physical presence and movement of the survey vessel in the operational area will be temporary and is not predicted to have a significant effect on other marine users. The inherent risk to other marine users is predicted to be '*Low'* (2).			
Standard Control Measures Considered			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Survey vessel will be fitted with lights, signals, AIS transponders and navigation and communications equipment, as required by the *Navigation Act 2012*.	Vessel navigational aids and communication equipment will enable other marine users aware of their presence and position, to reduce the possibility of interaction.	Benefit outweighs the cost. Control is standard practice.	**Accept**
Australian Hydrographic Office (AHO) will be informed of the activity prior to commencement.	Notification to AHO will enable them to generate navigation warnings (i.e. Notice to Mariners).	Benefit outweighs the cost. Control is standard practice.	**Accept**
Notification to AMSA's Joint Rescue Coordination Centre (JRCC).	Notification to AMSA JRCC will enable promulgation of radio-navigation warnings.	Benefit outweighs the cost. Control is standard practice.	**Accept**
Stakeholder consultation with relevant stakeholders.	Communicating information about the activity to other marine users ensures they are informed and aware, thereby reducing the likelihood of interference occurring.	Benefit outweighs the cost. Control is standard practice.	**Accept**
Vessel bridge-watch will be maintained 24 hours/ day.	Maintaining constant bridge watch will assist with early detection of approaching vessels.	Benefit outweighs the cost. Control is standard practice.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			

Control Measure	Environmental Benefit	Evaluation of Decision	Decision
Manage timing of the activity	Schedule activity to avoid sensitive/peak periods of use by other marine users (e.g. offshore petroleum support vessels, commercial fishers).	It is not possible to avoid all types of marine users. Overall a low predicted impact as the operational area does not fall within recognised shipping route, commercial fishing effort is not expected, and activity duration is very short.	**Reject**

ALARP Assessment

There are no alternatives to the use of a vessel to undertake the survey. The impact and risk assessment and evaluation has identified a range of control measures that when implemented are considered to manage the risk of interference to other marine users from the physical presence of the survey vessel. There are no reasonably practicable additional or alternative control measures to further reduce the risk of interference to other marine users. Managing the timing of the survey to avoid sensitive/ peak periods of use by other marine users is not possible as marine users could potentially be in the area all year round.

SapuraOMV's stakeholder consultation process is described in **Section 5**. During EP preparation, details of the activity have been communicated to relevant stakeholders as appropriate. In consultation, stakeholders are made aware of the operational area boundaries, and the nature and expected timing of the activities. Notice to Mariners and AUSCOAST warnings will be issued prior to the commencement of the survey detailing the location and nature of activities. The survey vessel will maintain navigation aids and communication equipment in compliance with industry standards and legislation requirements. No concerns have been raised by stakeholders regarding the proposed activities in the operational area.

With the proposed control measures in place, the residual risk of interaction/ interference with other marine users of the area was assessed as '*Low*' (2), classified as Type A decision and cannot be reduced further. With no additional or alternative control measures identified that would offer a net environmental benefit, the impacts and risks to other marine users are considered to be ALARP.

Residual Risk Summary

Consequence	Likelihood	Residual risk
Negligible (I)	Possible (C)	Low (2)

Demonstration of Acceptability

Are environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?	Yes – risks are reduced to ALARP, and the residual risk ranking is 'Low' (2).
Is the activity carried out in a manner consistent with the principles of ESD?	Yes – the activity was evaluated as having the potential to result in negligible consequence, and not result in serious or irreversible environmental damage.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?	Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?	Yes – management consistent with the: • Safety of Life at Sea (SOLAS) 1974; • *Navigation Act 2012*; and • AHP20 Mariner's Handbook for Australian Waters (5th edition).
Have stakeholder expectations been addressed?	N/A – no concerns raised.

The activity has been evaluated in accordance with SapuraOMV's HSE Policy objectives. The presence of the vessel and survey equipment may temporarily restrict other users from the operational area. However, these effects will be of very short duration (up to ~14 days), and are not likely to be significant given the low shipping activity and absence of fishing effort in the area.

The residual risk was assessed as '*Low*' (2). On this basis, it is considered that adherence to the environmental performance standards will manage the impacts and risks to other marine users from the physical presence aspect to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
Vessel presence / movements managed to minimise adverse interference to other marine users.	Consultation ongoing with all relevant persons on an as required basis during the activity.	On-going consultation records maintained in SapuraOMV Stakeholder Database, including assessment of feedback and SapuraOMV response.	SapuraOMV Senior HSE Specialist
	The Australian Hydrographic Office (AHO) will be notified no less than four working weeks before operations	Email records confirm AHO notified in the required timeframe prior to commencement of operations.	SapuraOMV Senior HSE Specialist

	commence for the promulgation of related notices to mariners.		
	Notification will be provided to AMSA JRCC for promulgation of radio-navigation warnings 24-48 hours before operations commence, including following information: • Vessel details, including name, call sign and Maritime Mobile Service Identity (MMSI); • Satellite communications details, including INMARSAT-C and satellite telephone; • Area of operation; • Requested clearance from other vessels; and • Notification of operations start and end.	Email records confirm AMSA notified in the required timeframe prior to commencement of operations.	Vessel Master SapuraOMV Senior HSE Specialist
	Survey vessel will be fitted with lights, signals, AIS transponders and navigation and communications equipment as required by the *Navigation Act 2012*.	Records (e.g. OVID/CMID) confirm that required navigation equipment is fitted to survey vessel to ensure compliance with the *Navigation Act 2012*.	Vessel Master
	Vessel bridge-watch will be maintained 24 hours/ day to assist with early detection of approaching vessels.	Vessel Bridge Logbook	Vessel Master

7.2 Physical Presence – Seabed Disturbance

Planned Activity
The following activities were identified as having the potential to result in seabed disturbance: • ROV operations (if required); and • Geotechnical survey techniques.
Hazard Identification
Seabed disturbance will occur from the following: • Cone Penetration Testing (CPT); • Piston coring/ Vibracore; • Box coring; and • ROV operations (if required). Sediment samples (piston coring/vibracoring and box coring) will be collected from the seabed at 24 - 36 locations within the operational area. Each sample is expected to disturb ~1-2 m^2. In addition, 24 - 36 CPTs will be completed to assess the in-situ strength of seabed soils. No samples will be collected during CPTs, but ~4-5 m^2 will be disturbed by the frame during each deployment. Following completion of the geotechnical sampling no equipment will be left on the seabed. ROV operations, if required, could result in localised and temporary scouring of the seabed and some increased turbidity, should the ROV pass in close proximity to the seabed resulting in mobilisation of finer fractions of seabed sediments. The extent of this footprint is likely to be minimal, but as a conservative measure, an estimate of seabed disturbance is ~4 m^2 per sampling location or 144 m^2 if used at each of 36 sites. The vessel will hold station using a dynamic positioning system and will not anchor in the operational area during the activity. The total planned seabed disturbance area is not expected to exceed ~470 m^2. It is foreseeable that any dropped objects may also result in seabed disturbance. Seabed disturbance from dropped objects is discussed in **Section 8.3**.
Environmental Impact Assessment
There are no known shipwreck sites in the operational area or surrounds. Seabed disturbance during the activity has the potential to impact:

- Benthic habitats and fauna.

Sediment sampling (i.e. coring activities) and the positioning of the CPT frame will result in removal of sediments, depressions on the seabed and localised scouring, resulting in direct and indirect impacts to associated benthic communities and habitats. Depressions left by the CPT frame will gradually infill within a matter of weeks following retrieval of the equipment, through deposition of detrital matter and movement of sediments by water currents. The use of geotechnical equipment may also result in temporary, localised increases in suspended sediment in the water column. Any plumes are expected to dissipate, but may result in deposition and potential smothering of the seabed in the immediate vicinity.

The benthic substrate within the operational area is expected to be made up of unconsolidated soft sediment, predominantly mud and calcareous substrates and be featureless with no significant known structural seabed features (such as reefs, sponge gardens or seagrass meadows) (**Section 4.5.5**). There are no fauna BIAs that relate to the seabed of the operational area. The activity may result in the mortality of sessile fauna within the disturbance footprint and potentially the mortality of associated benthic infauna within the area; however the total disturbance footprint from the geotechnical survey scope is estimated to be very small (approximately 0.00047 km^2) and the consequences of disturbance are considered to be Negligible (I).

The nearest seafloor KEF (Ancient Coastline at 125 m depth contour KEF) is located ~2.6 km south of the operational area, at its closest point. Direct impacts to this KEF will not occur and, given the distance, adverse effects from temporarily increased turbidity in the operational area are unlikely.

Given that the geotechnical activities are limited to the operational area, in water depths of ~147 m and in a location where the widespread nature of soft sediment infauna communities is characteristic of the region (RPS, 2012; Brewer et al. 2007), the potential disturbance is considered highly localised and will not result in a loss of sensitive or geographically restricted habitats. The small scale of disturbance and the rapid recovery/recolonisation predicted to occur once activities have ceased, the likelihood of measurable changes to ecosystem function or damage/reduction in fauna habitat values within the operational area due the geotechnical investigations is considered Possible (C), and the overall inherent risk is '*Low*' (2).

Standard Control Measures Considered

Control Measure	Environmental Benefit	Evaluation of Decision	Decision
Equipment deployment procedures	Equipment deployed in accordance with procedures to reduce the risk of an unintentional release to the marine environment.	Standard industry practice, environmental benefit outweighs costs of implementing procedure.	**Accept**
Equipment will be recovered from the seabed upon completion of the activity	The placement of equipment on the seabed may result in a temporary disturbance to benthic communities in the operational area. To promote the	Benefits considered to outweigh the costs.	**Accept**

	recovery and recolonisation of the seabed, all equipment will be retrieved at the end of the survey.		
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
No anchoring of vessels within the operational area	No anchoring of vessels within the operational area would eliminate seabed disturbance from anchor placement/ drag.	Anchoring not required during the geotechnical component of the survey. Benefit outweighs the cost.	**Accept**
ALARP Assessment			
The impact assessment has determined that, given the adopted controls, disturbance to benthic habitats may result in localised and short term effects (but not affecting ecosystems function). The impact assessment and evaluation has identified existing standard control measures that when implemented are considered to manage impacts and risks from geotechnical survey activities. Further opportunities to reduce impacts have been investigated, and no alternative control measures were identified. With the proposed control measures in place, the residual risk from seabed disturbance was assessed as '*Low*' (2), classified as Type A decision, and cannot be reduced further. With no reasonable additional or alternative control measures identified that would offer a net environmental benefit, the impacts and risks are considered ALARP.			
Residual Risk Summary			
Consequence	**Likelihood**	**Residual risk**	
Negligible (I)	Possible (C)	Low (2)	
Demonstration of Acceptability			
Are environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?		Yes – risks are reduced to ALARP, and the residual risk ranking is '*Low*' (2).	
Is the activity carried out in a manner consistent with the principles of ESD?		Yes – the activity was evaluated as having the potential to result in negligible consequence, and not result in serious or irreversible environmental damage.	

Are the potential risks and hazards consistent with SapuraOMV's policy and standards?		Yes – aligns with SapuraOMV's HSE Policy and HSEMS.	
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?		N/A –no relevant environmental guidelines/legislation regarding the environmental management with respect to this activity.	
Have stakeholder expectations been addressed?		N/A – no concerns raised.	
With the proposed control measures in place, and with no sensitive seabed features expected to occur in the operational area, the relatively small area of seabed disturbance (~470 m^2), coupled with and the short duration of the activity, the potential consequence of seabed disturbance on receptors is ranked as Negligible (I). Stakeholders have been informed of the proposed activity, as detailed in **Section 5**, no concerns have been raised by stakeholders regarding this hazard/risk. The activity has been evaluated in accordance with SapuraOMV's HSE Policy objectives and the residual risk was assessed as '*Low*' (2). On this basis, it is considered the adopted control measures are appropriate to manage the impacts of disturbance to the seabed to a level that is acceptable.			
Environmental Performance Outcomes, Standards and Measurement Criteria			
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**	**Responsibility**
Disturbance to the seabed is limited to planned activities within the operational area.	Deployment of submersible equipment will only be undertaken in suitable weather/sea state conditions.	Completed and approved Permit to Work (PTW) and Job Safety Analysis (JSA) records.	Vessel Master
	Equipment will be recovered from the seabed upon completion of the activity.	Daily operations report confirms recovery of all subsea equipment.	Vessel Master
	Equipment dropped to the marine environment is recovered where safe and practicable to do so.	Daily records show attempts to recover items lost overboard were undertaken where safe and practical to do so and corrective actions identified and undertaken.	Vessel Master

7.3 Light Emissions

Planned Activity
The following activities were identified as having the potential to generate light emissions: • Light spill from safety and navigational lighting on the survey vessel; and • Underwater light from ROV operations (if required).
Hazard Identification
The survey vessel will have external lighting to facilitate navigation and safe operations. Lighting will be used on the vessel 24 hours a day for the duration of the activity. Direct light spill on surface waters will be limited to the area directly adjacent to the survey vessel within the operational area. The light spill will be limited to the duration of the activity (up to ~14 days). Spot lighting may be used on an as-needed basis e.g. ROV deployment and retrieval. Lighting will typically consist of bright white lights (i.e. metal halide, halogen, fluorescent), typical of lighting used in the offshore petroleum industry and not dissimilar to lighting used for other offshore activities in the region, including shipping and fishing. Lighting on the ROV will change underwater ambient light levels up to several metres from the light source. Light emissions may cause: • Disruption to behaviour and orientation of light sensitive marine fauna (e.g. turtles and seabirds); and • Attraction of light-sensitive species (e.g. seabirds and fish), in turn affecting predator-prey dynamics.
Environmental Impact Assessment
Light emissions during the activity have the potential to impact: • Marine turtles; • Seabirds and migratory shorebirds; and • Fish and zooplankton. There is no known critical habitat within the operational area for EPBC listed species, and no BIA's for these potentially affected fauna. BIAs for whale shark foraging and pygmy blue whale distribution overlap the operational area, but these species sharks are not expected to be impacted by light emissions. For whale sharks, opportunistic feeding may occur as a result of prey aggregations around the light source. Given the fauna expected to occur within the operational area, impacts from light emissions are considered to be highly unlikely.

Marine Turtles

Marine turtles are particularly sensitive to artificial light and it is known to pose a threat to marine turtles as it can disrupt critical behaviours (DoEE, 2017a). Light pollution reaching turtle nesting beaches are widely considered detrimental owing to its ability to alter important nocturnal activities, including choice of nesting sites and orientation/navigation to the sea by hatchlings (Witherington and Martin, 2003). Pendoley (2014) found that first time nesting females are likely to be disturbed by light when they are selecting their first nesting beach, but experienced nesting females are not likely to be disturbed. Furthermore, Pendoley (2017) concluded there is no biological reason or evidence for light impacts on internesting turtles.

The most significant risk posed to marine turtles from artificial lighting is the potential disorientation of hatchlings following their emergence from nests (Rich and Longcore, 2006 in EPA, 2010). During this period, light spill from coastal port infrastructure and ships may 'entrap' hatchling swimming behaviour, reducing the success of their seaward dispersion and potentially increasing their exposure to predation via silhouetting (Salmon et al. 1992).

The National Light Pollution Guidelines states that a 20 km buffer (based on sky glow) to important habitat for turtles should be applied when considering possible impacts from light (DoEE, 2020). Given the Kanga-1 site survey operational area is located approximately 122 km away from the nearest turtle nesting beach (Legendre Island), and the nearest BIA boundary for marine turtles (flatback turtle) is ~46 km to the southeast of the operational area, consequences to adults and hatchlings are expected to be Negligible (I).

Seabirds

Studies in the North Sea confirmed that artificial light was the reason that birds were attracted to, and accumulated around illuminated offshore infrastructure; but that migratory birds are attracted to lights on offshore platforms when travelling within a radius of 3–5 km from the light source. Outside this area their migratory path will be unaffected (Marquenie et al. 2008). Birds may either be attracted by the light source itself or indirectly as structures in deep water environments tend to attract marine life at all trophic levels, creating food sources and providing artificial shelter for seabirds (Surman, 2002). The light sources associated with the survey vessel will be less than those on offshore platforms, but may also provide localised enhanced capability for seabirds to forage at night.

The operational area may be occasionally visited by migratory and oceanic birds but does not contain any emergent land that could be used as roosting or nesting habitat and contains no known BIAs (including feeding), for any species. Migratory shorebirds may be present in or fly through the region between July and December and again between March and April as they complete migrations between Australia and offshore locations (DSEWPaC, 2012b). Given the closest island (Legendre Island) is ~122 km to the southeast and the very short duration of survey activity, only a small number of seabirds and shorebirds may be affected by artificial light emissions. Consequently, light emissions from the survey vessel are unlikely to attract and/or affect the behaviour of large numbers of seabirds. As such, consequences to seabirds are considered Negligible (I).

Fish

The response of fish to light emissions varies according to species and habitat. Fish may be directly or indirectly attracted to light emissions in the immediate vicinity of the vessel. Experiments using light traps have found that some fish and zooplankton species are attracted to light sources (Meekan et al. 2001), with traps drawing catches from up to 90 m away (Milicich et al. 1992). Lindquist et al. (2005) concluded that artificial lighting associated with offshore oil and gas activities (i.e. platforms) resulted in an increased abundance of highly photopositive species. The concentration of organisms attracted to light results in an increase in food for predatory species, and marine predators are known to aggregate at the edges of artificial light halos. While the operational area does overlap the foraging BIA of the whale shark, given that a large proportion of the whale shark's diet is comprised of krill and other planktonic larvae, it is unlikely that a light source will lead to a significant increase in whale shark abundance in the vicinity of the survey vessel. During the activity, any light spill on to the surface waters will be localised and confined to immediately adjacent to the survey vessel. Fish may be temporarily attracted to the surface waters to prey on aggregations of plankton and zooplankton. As a result, this may lead to predation by higher order predators (e.g. predatory fish and sharks). Any effects on fish behaviour from lighting is predicted to be short-term and localised. Overall, consequences to fish from light emissions are considered to be Negligible (I), with no long-term impacts on local fish populations. Overall, impacts and risks to sensitive marine fauna from light emissions are predicted to be negligible, and given the lack of important areas within or near the operational area, the inherent risk has been assessed as '*Very Low*' (1).			
Standard Control Measures Considered			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Lighting will be the minimum required for safe work conditions and navigational purposes.	Light spill from unnecessary lighting reduced, lowering likelihood of impacts to the fauna from vessel lighting.	Good industry practice. Benefits in reducing impacts to marine fauna outweigh the minor costs.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Substitute external lighting with a lower intensity and longer wavelength light source.	Long wavelength and low intensity lights reduce potential for impacts on certain sensitive receptors from light emissions.	Given the potential impacts to turtles during this activity is negligible, implementing this control would not result in a reduction in consequence; and there would be considerably cost and logistical effort to source and replace all external lighting.	**Reject**

Limit or exclude night time activities.	Would eliminate potential impacts of artificial light during hours of darkness when light sources are more apparent and potential impacts are greatest.	Potential impacts from lighting during this activity is negligible. Would double the duration of the activity thereby increasing impacts from other sources (e.g. waste, air emissions etc.). Lighting required by law for navigational and safety purposes.	**Reject**

ALARP Assessment

There are no safe alternatives to the use of artificial lighting on the survey vessel. Artificial lighting is required for operational and navigation safety during the activity. A minimum level of artificial lighting is required on a 24-hour basis to alert other marine users of the activity and the presence of the vessel onsite. There are also minimum light requirements which will be necessary to provide safe working conditions. Reducing lighting at night to only navigation requirements would restrict the working hours resulting in the activity taking more than twice as long to complete. The increased risks / impacts with potentially larger scale consequences associated with reducing light levels are considered to present a cost that is grossly disproportionate to any environmental benefit.

The activity will not compromise the objectives set out in the National Light Pollution Guidelines for Wildlife (DoEE, 2020), as the operational area is >20 km from any important habitat (foraging, breeding, roosting or dispersal) for EPBC listed species that may be sensitive to light emissions (i.e. turtles, seabirds and fish).

There are no reasonably practicable additional or alternative control measures to further reduce the impacts and risks to marine fauna from light emissions. Given that lighting onboard the survey vessel will be compliant with industry standards, is not dissimilar to lighting used for other offshore activities in the region (shipping and fishing), and the short duration of the activity, the potential consequence of lighting on environmental receptors is ranked as Negligible (I).

The residual risk of light emissions was assessed as '*Very Low*' (1), classified as Type A decision, and cannot be reduced further. With no additional or alternative control measures identified that would offer a net environmental benefit, the impacts and risks of using artificial lighting at an intensity that will allow work to proceed safely is ALARP.

Residual Risk Summary

Consequence	Likelihood	Residual risk
Negligible (I)	Unlikely (D)	Very Low (1)

Demonstration of Acceptability	
Are environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?	Yes – risks are reduced to ALARP, and the residual risk ranking is '*Very Low*' (1).
Is the Activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?	Yes – the activity was evaluated as having the potential to result in negligible consequence, and not result in serious or irreversible environmental damage.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?	Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?	Yes – management consistent with the: • Convention of the Safety of Life at Sea (SOLAS) 1974; • *Navigation Act 2012*; • Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGS); • Marine Order 30 (Prevention of Collisions); • Marine Order 21 (Safety of Navigation and Emergency Procedures); • National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020); and • Relevant recovery plans and conservation advices for marine turtles and birds.
Have stakeholder expectations been addressed?	N/A – no concerns raised.
Lighting of vessels is industry standard and required to meet relevant maritime and safety regulations (e.g. *Navigation Act 2012*). The impact assessment has determined that routine light emissions from the survey vessel are unlikely to result in a potential impact greater than localised behavioural disturbance to low numbers of transient fauna within the operational area during the activity, and with no long-term effects. Further opportunities to reduce the impacts and risks from light emissions have been investigated above. Stakeholders have been informed of the proposed activity, as detailed in **Section 5**, and no concerns have been raised regarding this hazard/risk. With the control measures proposed, the residual risk from artificial light emissions was assessed as '*Very Low*' (1). On this basis, it is considered the adopted control	

measures appropriate to manage the impacts of light emissions to a level that is consistent with management plans and guidelines and is environmentally acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
Vessel lighting is reduced to that required for navigational and safe operations.	Vessel compliant with: • COLREGS; • Marine Order 30 (Prevention of Collisions); and • Marine Order 21 (Safety of Navigation and Emergency Procedures).	Vessel inspection confirms compliance with regulations.	Vessel Master
	Environmental awareness induction provided to vessel crew that includes requirements to minimise artificial lighting.	Induction presentation.	SapuraOMV Senior HSE Specialist
		Induction attendance records.	SapuraOMV Lead Engineer

7.4 Noise Emissions

Planned Activity
The following activities were identified as having the potential to result in underwater noise emissions: • Vessel operations (propeller cavitation, DP thrusters, operation of machinery and equipment); and • Geophysical data acquisition sources (MBES, SSS and SBP)
Hazard Identification
The field radiated by an acoustic source, with respect to its potential impact on marine living organisms, must be expressed both in terms of instantaneous maximum of received pressure (Sound Pressure Level, or SPL) and cumulative intensity (Sound Exposure Level, or SEL). This implies accounting for the source nominal transmitted sound level, its frequency (defining both its harmfulness and its propagation losses), its spatial distribution (angular directivity), and its temporal characteristics (pulse duration and repetition frequency). Obviously, the received sound field also depends on several propagation phenomena (transmission losses and multipath structure) (Lurton, 2016).
Vessel Operations
Vessel noise Vessel noise comprises a combination of continuous noise generated by engine and machinery noise, and modulated, broadband noise produced by propeller rotation and cavitations (Jensen et al. 2009; Wales and Heitmeyer, 2002; Hildebrand, 2009). The survey vessel may use DP while maintaining position during geotechnical survey operations. The main source of noise from a vessel using DP are the vessel thrusters. Vessel noise emissions varies with the size, speed, and engine type and the activity being undertaken. Noise levels for a range of vessels have been measured at 164-182 dB re 1 µPa @ 1 m (SPL) at dominant frequencies between 50 Hz and 7 kHz (Wyatt, 2008; Simmonds et al. 2004). McCauley (1998) measured underwater broadband noise of up to 182 dB re 1 µPa @ 1 m from support vessels when holding position at a drill site, with levels decreasing by around 34 dB within 50 m, and dropping to around 120 dB re 1 µPa at 3.5 km from the rig. This sound level will be higher than for any machinery on the vessels. McCauley (1998) also measured underwater sound levels while the vessel was transiting at 11 kts, and found the distance to 120 dB re 1 µPa to be approximately 1 km. Similar noise levels are expected to be generated by survey vessels used for this activity. The survey vessels will ensonify the surrounding waters most when they use DP for holding position during geotechnical activities. The survey vessel will travel no faster than 6 knots within the operational area and comply with EPBC Regulation 2000 – Part 8 Interacting with Cetaceans and Whale Shark Management Program Guidelines, to reduce the likelihood of collisions (see **Section 8.4**). Implementing these controls may reduce the

noise generated by vessels in proximity to cetaceans and whale sharks as vessels will be travelling slower; which may reduce underwater noise from engines and propeller cavitation, and reduce noise levels received by these fauna by maintaining a separation distance to the vessel.
Geophysical survey (MBES, SSS, SBP)
Multibeam Echo Sounder Typical MBES' used in survey work can include the Reson Seabat and the R2Sonic products. These systems operate at 200-400 kHz, with a variable total beam width, although 60° is common. The R2Sonic 2024 echo sounder transmits power up to 221 dB re 1 μPa @ 1 m (SPL), with a short pulse width (15 μs to 1 ms). However, Lurton (2016) determined that medium to high-frequency MBES systems (typical frequencies 70; 100; 150 kHz) are designed for shallow- to intermediate-depth mapping, such as the continental shelf, with water depths down to 200 m, and that these MBES' do not normally exceed 215–220 dB re 1 μPa @ 1 m. This sonar generates only high frequency signals, and as such will only be relevant for fauna with sensitivity to signals of approximately 70 kHz or higher, which excludes low and mid-frequency cetaceans, fish, and turtles. This source can be considered an impulsive sound source for impact assessment purposes for this activity. **Side Scan Sonar** SSS uses the transmission of sound energy to acquire seabed and sub-seabed information. SSS are towed close to the seafloor, typically 10 to 20 m above the seabed, thus the beam will be restricted to a swath close to the seabed. The sonar is highly directional, based on the configuration of the transducers, and thus has a focused beam of energy, with distances to sound levels outside the beam significantly less than those in the beam. SSS devices operate at frequencies similar to those used in 'fish finders' by commercial fishers. This technique involves high frequency sound pulses typically between 100-500 kHz with the higher frequencies providing a greater resolution (DECC, 2011; GA, 2020). Measurements of an EdgeTech 4200 were reported in Crocker and Fratantonio (2016) for 100 and 400 kHz modes, with a maximum per-pulse source level of 176 dB re 1 μPa^{2}s @ 1 m (SEL), 205 dB re 1 μPa @ 1 m (SPL) and 210 dB re 1 μPa @ 1 m Peak (PK). Austin et al. (2013) also measured the system during an operational program, focusing on the 120 kHz impulses. The authors reported a PK of <175 dB re 1 μPa and an SPL of <170 dB re 1 μPa at 39 m, with the distance from pulses to an SPL of 160 dB re 1 μPa calculated to be 130 m. Therefore, SSS surveys present a substantially lower noise disturbance risk compared to the higher-energy and broadscale nature of seismic surveys as they emit much lower levels of energy and operate at higher frequencies that rapidly attenuate in the water column. The noise generated will be of considerably lower intensity than vessel noise and predominantly at high frequencies (>100 kHz), that are outside the hearing thresholds of low-frequency cetaceans, fish and turtles (DECC, 2011). **Sub-bottom Profiler**

SBP systems operate at low to moderate frequency (approximately 0.5-40 kHz) directing beams of sound towards the seabed and therefore horizontal sound propagation is limited.

Of the geophysical equipment to be used for survey, the SBP boomer was identified as the the most relevant to the assessment of potential impacts to receptors. Recent work in the Otway Basin in shallower water depths (McPherson and Wood, 2017; Wood and McPherson 2019) considered a range of boomers (AP3000, AA251, AA300 and AA301). The assessment of the four boomers identified that the AA301 has the highest peak source pressure level of 215 dB re 1 μPa^2 m^2, with others ranging from 210.8 to 212 dB re 1 μPa^2 m^2. The per-pulse SEL of the modelling by McPherson and Wood (2017) for SEL_{24h} (i.e. 24 hrs accumulation period) from the AP3000 boomer is considered an appropriate approximation of the potential sound fields from the array of SBP boomers and ranges to SEL_{24h} impact criteria (Wood and McPherson, 2019).

Source levels of geophysical equipment that are representative of that proposed for use in the survey are summarised in **Table 7-2**.

Table 7-2 Source levels of equipment proposed for use

Noise Source	Frequency Range (kHz)	Estimated Sound Pressure Level (SPL) (dB re 1μPa @ 1 m)	Estimated Sound Peak Pressure Level (SPL) (dB re 1μPa @ 1 m PK)	Estimated Sound Exposure Level (SEL) (dB re 1μPa^{2}s @ 1 m)
MBES	70 - 200	215 - 220		
SSS	100 - 500	137 - 200	210	176
SBP (Boomer)	0.5 - 40	142 - 214	215	172

Environmental Impact Assessment

Underwater noise generated by the activity has the potential to impact sensitive receptors, including:

- Transient, EPBC-listed cetacean, turtles or whale sharks; and
- Fish.

The operational area is located in waters ~147 m deep. The fauna associated with this area will be predominantly soft-sediment benthic invertebrates, pelagic and demersal species of fish, with migratory species such as cetaceans, turtles and whale sharks present in the area occasionally.

The context of the exposure of sound plays a critical and complex role in the way an animal might respond (Gomez et al. 2016; NMFS, 2016). Elevated underwater noise can affect marine fauna, including cetaceans, turtles, sharks and fish in three main ways (Richardson et al. 1995; Simmonds et al. 2004):

- Injury to hearing or other organs. Hearing loss may be temporary (temporary threshold shift (TTS)) or permanent (permanent threshold shift (PTS));
- Masking or interference with other biologically important sounds such as communication or echolocation; and

- Disturbance leading to behavioural changes or displacement of fauna.

Listed threatened and/or migratory species that could be potentially impacted by underwater noise and that may be present within the operational area include cetaceans, turtles and whale sharks. The operational area overlaps the distribution BIA for pygmy blue whales and the whale shark foraging BIA; however, these behaviours do not typically involve individuals remaining in one location for extended periods of time. Although five marine turtle species may occur within the operational area no BIAs or habitat critical to the survival of the species occur within the operational area.

Current research shows that cetaceans differ in their hearing capabilities, in both absolute hearing, and as well as the frequency band of hearing (Richardson et al. 1995; Southall et al. 2007). Noise impact thresholds proposed by the U.S. National Oceanic and Atmospheric Administration and National Marine Fisheries Service (NMFS, 2018a) for cetaceans, defines cetaceans into three functional hearing groups based on their frequency hearing ranges. The types of cetacean with the potential to occur in the operational area include low-frequency (LF) and mid-frequency (MF) hearing groups. No high-frequency (HF) cetaceans are likely to be present in the operational area and surrounding waters, and accordingly the impact assessment is focused on LF and MF cetaceans. The thresholds that could result in impacts are detailed in **Table 7-3**.

Underwater hearing in sea turtles has not been thoroughly studied. It is thought that sea turtles do not use sound for communication between individuals underwater, but rather that they use sound for navigation, finding prey, and avoiding predators (NOAA, 2016). Turtles are not considered to be as sensitive to sound as cetaceans. Marine turtles do not have an external hearing organ but can detect sound through bone-conducted vibration in the skull and by using their shell as a receiving surface (Lenhardt et al. 1985). Based on limited data regarding noise levels that illicit a behavioural response in turtles, the United States National Science Foundation criterion of 166 dB re 1 μPa (SPL) is typically applied (NSF, 2011; **Table 7-3**). Popper et al. (2014) reported that turtles are highly likely to exhibit a behavioural response when they are near an airgun (tens of metres), a moderate response if they encounter the source at intermediate ranges (hundreds of metres), and a low response if they are far (thousands of metres) from the airgun.

The hearing capabilities of whale sharks have not been studied specifically, but it has been suggested that, similar to other cartilaginous species, they are likely to be most responsive to low frequency sounds (Myberg, 2001). No specific impact criteria or thresholds have been identified for sharks and rays. As a conservative and precautionary approach, exposure guidelines for fish with no swim bladder have been used for this assessment (**Table 7-3)**. There are no peer reviewed published thresholds for comparison of behavioural disturbance effects in fish as a result of exposure to seismic or continuous sound sources.

Table 7-3 Threshold criteria for underwater noise levels associated with impulsive and continuous sound

Receptor	Generalised Hearing Range	Threshold Criteria for Potential Impacts							
		Physical Injury		PTS		TTS		Behavioural	
		Mortal or potential mortal injury	Recoverable injury	Impulsive	Continuous	Impulsive	Continuous	Impulsive	Continuous

LF cetaceans	7 Hz to 35 kHz[a]			219 dB PK[a] or 183 dB SEL_{24h}[a]	199 dB SEL_{24h}[a]	213 dB PK[a] or 168 dB SEL_{24h}[a]	179 dB SEL_{24h}[a]	160 dB RMS[b]	120 dB RMS[b]
MF cetaceans	150 Hz to 160 kHz[a]			230 dB PK[a] or 185 dB SEL_{24h}[a]	198 dB SEL_{24h}[a]	224 dB PK[a] or 170 dB SEL_{24h}[a]	178 dB SEL_{24h}[a]		
Marine turtles	50 to 1600 Hz[d] 50-400 Hz (greatest sensitivity)			232 dB PK[e]		226 dB PK[e]	Moderate risk within tens of metres of source[c]	166 dB re 1µPa[f]	Moderate risk within tens of metres of source[c]
Fish and sharks (no swim bladder)	20 Hz to 1.5 kHz[g]	>213 dB PK[c] or >219 dB SEL_{24h}[c]	>213 dB PK[c] or >216 dB SEL_{24h}[c]			>>186 dB SEL_{24h}[c]	Moderate risk within tens of metres of source[c]	(N) High (I) Moderate (F) Low	
Fish (swim bladder not involved in hearing)	100 Hz to 1 kHz[h]	>207 dB PK[c] or 210 dB SEL_{24h}[c]	>207 dB PK[c] or 203 dB SEL_{24h}[c]			>>186 dB SEL_{24h}[c]		(N) High (I) Moderate (F) Low	
Fish (swim bladder hearing)	100 Hz to 2 kHz[h]	>207 dB PK[c] or 207 dB SEL_{24h}[c]	>207 dB PK[c] or 203 dB SEL_{24h}[c]			186 dB SEL_{24h}[c]		(N) High (I) High (F) Moderate	
Fish eggs and fish larvae		>207 dB PK[c] or 210 dB SEL_{24h}[c]	(N) Moderate (I) Low (F) Low			(N) Moderate (I) Low (F) Low		(N) Moderate (I) Low (F) Low	

Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of meters, intermediate (I) - hundreds of meters, and far (F) – thousands of meters.

[a] NMFS (2018a) - hearing range representative of the group based on an incomplete sampling of species
[b] NMFS (2018b)
[c] adapted from Popper et al. (2014)
[d] DoEE (2017a)
[e] Finneran et al. (2017)
[f] NSF (2011)
[g] Chapuis et al. (2019)
[h] Popper et al. (2003) – hearing range representative of the group, but differences between some species noted

Cetaceans

The frequency range of the SBP overlaps the hearing range of the low frequency cetaceans (**Table 7-3**). Low frequency cetaceans are comprised of all the baleen whales including pygmy blue whales. Baleen whales use low-frequency signals for communication (12Hz-8 kHz, but predominantly less than 1 kHz; McCauley, 1994). This, combined with studies of their hearing apparatus, suggests that their hearing is also best adapted for low frequency sound (McCauley, 1994; Richardson et al. 1995). The higher frequency source levels from the SSS and MBES are outside the auditory range for baleen whales. Therefore, PTS, TTS, behavioural impacts, and the interference with intraspecific communication (i.e. masking), are not expected. This is further supported by Lurton (2016) who found that it is very likely the acoustical energy radiated by MBES has very little chance to cause physiological damage or even behavioural changes in marine mammals.

To date, few studies have modeled or measured the noise discharged from various geophysical survey techniques. However, much work has been done of the noise attenuation from seismic surveys. The intensity of sound emitted during a seismic survey drops rapidly with increasing distance and depending on local conditions can be reduced to background intensity within a few tens of kilometres (APPEA, 2009). Since the source levels of geophysical surveys is much lower than that of a seismic survey (typical SPL of a seismic survey airgun array is ~230 dB re 1μPa @ 1 m), it is expected that the intensity of sound levels from the geophysical survey will also decrease rapidly, reaching ambient levels quicker than that of a seismic survey (due to a lower source level). Furthermore, the geophysical sources have a directionally focused beam platform which predominantly points downwards at the seafloor. The upper range of SBP sound output potentially used in the survey (215 dB re 1 μPa @ 1 m PK) is not expected to result in PTS for cetaceans, and given the short-term duration of the survey no prolonged exposure would occur. Given other marine fauna have less sensitive hearing than cetaceans, PTS impacts on other EPBC listed species is also not expected to occur. The modelling study by McPherson and Wood (2017) found that the NMFS (2018a) thresholds for PTS in low and mid-frequency cetaceans, including those for accumulated SEL, were not exceeded, and that a sound level of 160 dB re 1 μPa (SPL) was reached at 145 m from the source.

It is possible that TTS effects could occur; however, in the unlikely event that TTS did occur, it would be limited to at most a few individuals and the effects will be temporary and recoverable. The area where noise levels may exceed behavioural response thresholds represents a very small proportion of the available pygmy blue whale distribution habitat. Furthermore, given the short duration of the survey (up to ~14 days), disruption to transient individuals is unlikely and any short term impacts are unlikely to be ecologically significant at the population level.

The auditory band width of baleen whales also overlaps the low frequency broadband noise produced by thrusters during vessel positioning and movement. Impacts are likely to be limited to masking or behavioural disturbance, as the noise levels likely to be produced by operations are below proposed injury criteria for low frequency cetaceans (**Table 7-3**). However, masking and behavioural impacts are considered temporary and localised because the marine fauna and survey vessel will be almost constantly moving and therefore no single area will be impacted for any length of time. SVT undertook modelling for an offshore support vessel (Shell, 2018) at three locations in water depths of 152 m to 192 m. These modelled locations were similar depths to that of the operational area. Results indicated that for the support vessel, the cetacean PTS and TTS criteria were not reached under any modelled scenarios.

Behavioural responses to noise are highly variable and context-specific. Cetaceans approaching the survey vessel will be gradually exposed to increasing noise levels and therefore, animals will not be startled by sudden or loud noises and behavioural responses are expected to be limited (Southall et al. 2007). However, it is reasonable to expect that cetaceans may demonstrate avoidance behaviour to the noise generated by the survey vessel. Pygmy blue whales may occur in the operational area, with overlap of the distribution BIA for this species (see **Figure 4-8**). Therefore when transiting through the area, pygmy blue whales may deviate slightly from their path. However, the potential impacts are considered to be negligible, with respect to the noise levels associated with routine operations of the survey vessel.

Marine Turtles

The Recovery Plan for Marine Turtles in Australia (DoEE, 2017a) identifies noise interference as a threat to turtles. It details that exposure to chronic (continuous) loud noise in the marine environment may lead to avoidance of important habitat. Although marine turtles may occur within the operational area, the area affected by sound levels that can cause behavioural responses does not contain critical habitat or BIAs for marine turtles.

The upper ranges for sound outputs from the geophysical equipment (**Table 7-2**) are not expected to result in PTS or TTS for marine turtles. Any impacts to turtles are likely to be limited to avoidance behaviour where they may move away from the vessel as it is undertaking the geophysical investigations. In addition, the area of impact is small, as the operational area is 16 km^2. Therefore, it is anticipated that potential sound generated behavioural effects on marine turtles is unlikely to have a significant impact on individuals or at a population level. As such, any impacts are considered to be Minor (II).

Sharks and Fish

There is a wide range of susceptibility and resilience to underwater noise pulses among fish. Direct physical damage may occur to fish if they approach within a very close range of a few metres (<5 m) of a seismic source (Gausland, 2000; McCauley et al. 2003). Demersal and epibenthic fish species are located towards the bottom of the water column and are beyond this range of direct physical damage. Pelagic fish species are highly mobile and are likely to move away from the noise source if the sound levels become uncomfortable (McCauley et al. 2003).

The benthic substrate within the operational area is expected to be made up of unconsolidated soft sediment, predominantly mud and calcareous substrates and be featureless with no known sensitive seabed features (such as reefs, sponge gardens or seagrass meadows) (**Section 4.5.5**). Therefore, site-attached fish species are not expected. Individual demersal fish may be impacted in the vicinity of the activity and mobile pelagic species may traverse the operational area. However, the operational area is not known to be an important spawning or aggregation habitat for commercially caught targeted species. Therefore, no impacts to fish stocks are expected.

Impulsive noises from survey equipment could result in physiological impacts to fish located within metres of the sound source. The modelling study by McPherson and Wood (2017) and Wood and McPherson (2019) found that the noise effect criteria for mortality/potential mortal injury for fish without a swim bladder is predicted to be at 0.6 m, and 1.6 m for those with a swim bladder. The geophysical survey will not result in prolonged exposure to fish, and the likelihood of fish being close enough to the sound source for physiological impacts to occur is considered remote. Therefore, it is expected that any impacts to fish, including sharks from geophysical activities will be restricted to temporary behavioural changes (avoidance) in any isolated individuals that may transit the area in close proximity to the operating energy source. This aligns with the Popper et al. (2014) guidelines, which report that there is the potential for high risk of behavioural impacts in fish species near a seismic source (tens of metres) with the level of risk declining to low at thousands of metres from a seismic source. However, the source levels of geophysical surveys are much lower than that of a seismic survey.

The operational area overlaps the foraging BIA for whale sharks, with peak numbers expected in the operational area between September and November. It is expected that the potential effects to whale sharks associated with acoustic noise will be the same as for other pelagic fish species. Based on the duration (up to ~14 days) of geophysical activities, and the control measures that will be implemented, predicted noise levels are not considered likely to cause injury or TTS effects, or result in any ecologically significant impacts at a population level for any species of shark or fish that may be present within or adjacent to the operational area. As such, any impacts are considered to be Minor (II).

For continuous/ non-impulsive noise sources, behavioural responses in fish, which are less sensitive to noise than cetaceans, are more likely to occur within tens or hundreds of metres from vessels (Popper et al. 2014). While fish may show an initial behavioural response, fish are known to quickly habituate to continuous noise sources (Spiga et al. 2012; Nichols et al. 2015; Johansson et al. 2016). Popper et al. (2014) notes that there is no direct evidence of mortality or potential mortal injury to fish from ship noise. Popper et al. (2014) details that risks of mortality and potential mortal injury, and recoverable injury impacts to fish with no swim bladder (sharks) is low and that TTS in hearing may be a moderate risk near (tens of metres) the vessel. For fish with a swim bladder risks of mortality and potential mortal injury impacts are low. No cumulative impacts are expected as there are no sensitive benthic habitats likely to support site-attached fish in the operational area.

During the activity, the survey vessel is required to comply with Whale Shark Interaction Guidelines, and vessel speeds will be limited to 6 knots within the operational area, to reduce the likelihood of collisions (see **Section 8.4**). Implementing these controls may reduce the noise generated by vessels in proximity to whale sharks as vessels will be travelling slower; which may reduce underwater noise from engines and propeller cavitation. Therefore, potential impacts from vessel noise are likely to be restricted to temporary avoidance behaviour in individuals transiting through the operational area, and are therefore considered localised with no lasting effect. There are no habitats or features within the operational area that would restrict fish and sharks from moving away from vessels.

The Conservation Advice for whale sharks (*Rhincodon typus*) (TCCS, 2015d) does not identify noise impacts as a threat to the species.

Protected Areas

The ancient coastline KEF is located ~2.6 km south of the Kanga-1 site survey operational area. While sound levels may be above ambient noise levels at this range, the benthic communities associated with this KEF are not expected to be impacted, as the noise levels will be below thresholds that cause behavioural impacts, TTS or PTS.

Summary

It is possible that physical and behavioural impacts may occur from geophysical operations. However, no sources of noise associated with the activity are expected to have the potential to result in PTS. With the exception of the SBP, no sources of noise associated with the activity are expected to have the potential to result in TTS. Potential behavioural responses for various groups of sound sensitive marine fauna are expected, at a worst case, to be limited to a few kilometres from the source for the duration of the geophysical activities. Based on the short duration of the survey (up to ~14 days), and with the control measures proposed, predicted noise levels from geophysical activities are not considered likely to cause any ecologically significant impacts at a population level for any cetacean, turtle or whale shark that may be present within or adjacent to the operational area.

Gradual exposure to continuous noise sources, such as vessel engines, are generally regarded as being less harmful and less likely to startle or stress marine fauna than rapid-onset impulsive noise sources (Hamernik et al. 1993; Hamernik et al. 2003; Southall et al. 2007). As such, exposure that would result in significant alteration of behaviour is not expected, and as such any consequences are considered to be Negligible (I).

Standard Control Measures Considered

Control Measure	Environmental Benefit	Evaluation of Decision	Decision
Selection of techniques with the lowest intensity sources that meet operational objectives.	Reduces risk of physical and behavioural impacts to marine fauna while still meeting survey objectives.	Good industry practice. Benefits in reducing impacts to marine fauna outweigh the costs incurred.	**Accept**
Survey vessel will comply with EPBC Regulations 2000 – Part 8 Division 8.1.	Reduces risk of physical and behavioural impacts to cetaceans from noise, by maintaining separation distances if cetaceans are sighted, and vessels will slow down or move away if fauna are in proximity.	Operational costs to adhere to marine fauna interaction restrictions, such as vessel speed and direction, are based on legislated requirements and must be accepted.	**Accept**
Vessels will comply with Whale Shark Interaction Guidelines.	Reduces risk of physical and behavioural impacts to whale sharks from noise by maintaining separation distances if whale sharks are sighted, and vessels will slow down or move away if fauna are in proximity.	Benefits in reducing impacts to whale sharks outweigh the minor costs incurred by SapuraOMV.	**Accept**

Environmental awareness induction will be provided to vessel crew prior to activities that includes marine fauna interaction requirements.	Reduces risk of physical and behavioural impacts to marine fauna because all crew are aware of requirements.	Good industry practice, some operational costs associated, but environmental benefit outweighs cost.	**Accept**
Machinery and equipment maintained in accordance with planned maintenance system (PMS).	Reduces risk of excessive noise due to poor maintenance.	Standard industry practice, environmental benefit outweighs cost.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Adjust the activity schedule to occur entirely outside of sensitive periods (e.g. peak whale shark season).	Adjusting the activity schedule to avoid sensitive periods for marine fauna adjacent to the operational area may reduce risk of impacts from noise emissions.	Variation of timing of specific activities is not feasible as activity is subject to schedule constraints and vessel availability. Significant cost and schedule impacts if activities avoid specific timeframes.	**Reject**
Implementation of EPBC Act Policy Statement 2.1 - Part A Standard Management Procedures, for whales, if an acoustic source for the survey exceeds cetacean TTS thresholds (see **Table 7-3**).	Includes controls that reduce the risk of harm to marine fauna. The checklist includes standards for: • Marine fauna observation; • Pre-start-up observations; • Operational and shut-down protocols; and • Low visibility and night-time operations.	Some operational costs associated but benefits in reducing impacts to marine fauna outweigh the costs.	**Accept**
Dedicated marine fauna observer (MFO) onboard for duration of the activity, if occurring during peak activity times (May-June and Nov-Dec) for pygmy blue	A dedicated MFO onboard during peak activity times would improve the ability to implement Part A of EPBC Policy	Some operational costs associated but benefits in reducing impacts to marine fauna outweigh the costs.	**Accept**

<table>
<tr><td>whales in the operational area and EPBC Act Policy Statement 2.1 - Part A Standard Management Procedures is implemented.</td><td>Statement 2.1 if marine fauna at risk of harm from underwater noise emissions.</td><td></td><td></td></tr>
<tr><td colspan="4">ALARP Assessment</td></tr>
<tr><td colspan="4">The activity will generate various types of sound; however, the effects associated with vessel operations and geophysical activities are well understood and regularly practised offshore. Sound emissions from vessel thrusters are unavoidable; however, will be intermittent during the activity. Given the open nature of the marine environment, it is not expected that any behavioural disturbance would result in impacts greater than incidental changes to transitory behaviours, with population impacts from changes to behaviours not expected.

SapurOMV considers the adopted control measures to be appropriate in reducing the environmental impacts associated with underwater sound on marine fauna, and the residual risk from noise emissions was assessed as ‘Low’ (2), and classified as a Type A decision. Two additional control measures were identified and adopted to further reduce the impacts without disproportionate costs, compared to the benefit of the potential impact reduction. Therefore, the residual risk from noise emissions generated during the activity is considered to be reduced to ALARP.</td></tr>
<tr><td colspan="4">Residual Risk Summary – Noise from Survey Vessels and Mechanical Equipment</td></tr>
<tr><td>Consequence</td><td>Likelihood</td><td colspan="2">Residual risk</td></tr>
<tr><td>Negligible (I)</td><td>Possible (C)</td><td colspan="2">Low (2)</td></tr>
<tr><td colspan="4">Residual Risk Summary – Geophysical Survey</td></tr>
<tr><td>Consequence</td><td>Likelihood</td><td colspan="2">Residual risk</td></tr>
<tr><td>Minor (II)</td><td>Unlikely (D)</td><td colspan="2">Low (2)</td></tr>
<tr><td colspan="4">Demonstration of Acceptability</td></tr>
<tr><td colspan="2">Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between ‘Very Low’ (1) to ‘Medium’ (3)?</td><td colspan="2">Yes – risks are reduced to ALARP, and the residual risk ranking is ‘Low’ (2).</td></tr>
<tr><td colspan="2">Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?</td><td colspan="2">Yes – the activity was evaluated as having the potential to result in negligible or minor consequence, and not result in serious or irreversible environmental damage.</td></tr>
</table>

<table>
<tr><td>Are the potential risks and hazards consistent with SapuraOMV's policy and standards?</td><td>Yes – aligns with SapuraOMV's HSE Policy and HSEMS</td></tr>
<tr><td>Have legislative and other requirements been met? Industry codes, standards and guidelines applied?</td><td>Yes – Management consistent with EPBC Regulations Part 8 and Whale Shark Interaction Guidelines. Implementation (for cetaceans) of standard management measures of Part A of EPBC Policy Statement 2.1 for geophysical operations, if applicable.
Controls implemented will minimise the potential impacts from the activity to species identified in recovery plans and conservation advices as having the potential to be impacted by noise emissions.
Relevant species recovery plans, conservation management plans and management actions, including but not limited to the:
• Blue Whale Conservation Management Plan 2015 – 2025 (DoE, 2015b); and
• Conservation Advice (Rhincodon typus) whale shark (TSSC, 2015d).</td></tr>
<tr><td>Have stakeholder expectations been addressed?</td><td>N/A – no concerns raised.</td></tr>
<tr><td colspan="2">During geophysical operations the EPBC Act Policy Statement 2.1 Part A will be implemented (for cetaceans) with the additional measure of an MFO on board (Part B: Additional Management Procedures) during peak activity times for pygmy blue whales, if required (refer to Table 4-10).
Anthropogenic noise from seismic surveys has been identified as a threat to pygmy blue whales in the Conservation Management Plan for the Blue Whale (DoE, 2015a), but has not been identified as a threat to whale sharks in either the Approved Conservation Advice (TSSC, 2015d) or previously in force Whale Shark Recovery Plan 2005 – 2010 (DEH, 2005b), and noise pollution is not identified as a pressure to whale sharks in the Marine Bioregional Plan for the NWMR (DSEWPaC, 2012a). Noise interference has been identified as a threat to marine turtles (DoEE, 2017a).
The above listed controls to be adopted during the activity are in alignment with the actions identified in the conservation management documents; such as:
• Anthropogenic noise in BIAs will be managed such that any blue whale continues to utilise the area without injury; and
• EPBC Act Policy statement 2.1 – Interaction between offshore seismic exploration and whales is applied to all SBP source operations that have the potential to cause injury to cetaceans.
The impact assessment has determined that noise disturbance through vessel operations and geophysical activities is unlikely to result in a potential impact greater than localised non-significant impacts to marine fauna, with no lasting effect. Stakeholders have been informed, as detailed in Section 5 and no concerns have been raised regarding this hazard/risk. With the control measures proposed, the residual risk associated with noise emissions was assessed</td></tr>
</table>

as '*Low*' (2). On this basis, it is considered that adherence to the environmental performance standards will manage the impacts and risks from noise emissions to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
No death or injury to marine fauna populations from vessel operations.	Vessel activities are undertaken in accordance with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans: • Vessels will not knowingly travel faster than 6 knots within 300 m of a whale or 150 m of a dolphin; • Vessels will not knowingly get closer than 100 m of a whale or 50 m of a dolphin; and • If a cetacean approaches the vessel within the above zones, the vessel will avoid rapid changes in engine speed or direction.	Daily operations reports note when cetaceans were sighted in the caution zone and interaction management actions implemented.	Vessel Master
	Vessels adopt measures consistent with the DPaW Whale Shark Management Program (2013), including: • Taking action to avoid approaching or drifting closer than 30 m of a whale shark; and • Not exceeding 8 knots within 250 m of a whale shark.	Daily operations reports note when whale sharks were sighted in the caution zone and interaction management actions implemented.	Vessel Master

	Environmental awareness induction provided to vessel crew, that includes marine fauna interaction requirements.	Induction presentation.	SapuraOMV Senior HSE Specialist
		Induction attendance records.	SapuraOMV Lead Engineer
	Machinery and equipment maintained in accordance with PMS to reduce risk of excessive noise due to poor maintenance.	PMS records.	Chief Engineer
No significant adverse impacts to marine fauna populations from geophysical operations.	Part A of EPBC Policy Statement 2.1 is applied in full to mitigate potential impacts to whales throughout SBP operations with potential to cause cetacean injury including: • Observation zone: 3+ km horizontal radius from sound source. • Shut-down zone: 500 m horizontal radius from sound source. • Pre-Start-up visual observations • Soft-start procedures • Start-up Delay procedures • Operational shut-down and low-power procedures • Night-time and low visibility procedures • Sighting reports	Daily operations reports confirm that precaution zones and procedures are implemented in accordance with Part A of EPBC Policy Statement 2.1, if applicable.	Vessel Master Party Manager
	Marine Fauna Observer (MFO) onboard to implement Part A of EPBC Policy Statement 2.1 during peak activity (May-June and Nov-Dec) times for pygmy	MFO report demonstrates marine fauna observation undertaken throughout SBP operations during peak activity times, if applicable.	SapuraOMV Senior HSE Specialist

	whales throughout SBP operations with potential to cause cetacean injury.	Crew list, if applicable.	

7.5 Atmospheric Emissions

Planned Activity
The following activities were identified as having the potential to result in atmospheric emissions: • Vessel operations.
Hazard Identification
Atmospheric emissions will be generated through the use of combustible engines, compressors, generators and equipment onboard the survey vessel. These emissions will consist of greenhouse gases (GHG), principally CO_2, but also non-GHG pollutants such as sulphur oxides (SOx) and nitrogen oxides (NOx). Discharges to the atmosphere may include contaminants including volatile organic compounds (VOCs), aromatic hydrocarbons, sulphur-containing compounds, heavy metals and particulate matter (e.g. soot). The survey vessel may use ozone-depleting substances (ODS) in closed-system rechargeable refrigeration systems. There is no plan to release ODS to the atmosphere. Atmospheric emissions from the survey vessel during the activity have the potential to result in localised changes in air quality and subsequent exposure of sensitive receptors to air pollutants. Atmospheric emissions also have the potential to contribute to regional, national and global GHG emissions.
Environmental Impact Assessment
Atmospheric emissions during the activity have the potential to impact: • Air quality; • Global GHG levels. Fuel combustion has the potential to result in localised and temporary reduction in air quality in the immediate vicinity of the discharge point, through the presence of air toxins in engine exhausts. Elevated concentrations (i.e. beyond accepted air quality standards) of air toxins can have adverse consequences to human health and fauna. Emissions may also contribute to the global GHG effect. Given the open, offshore location of the operational area, it is expected that gaseous emissions will quickly dissipate into the surrounding atmosphere. As the activity will occur in remote, offshore waters (closest town to the operational area being ~163 km SSE), the only sensitive receptors that could potentially be affected are the workforce (i.e. onboard the vessel) and seabirds. Considering the very short duration of the activity and the volumes of emissions involved, the potential consequences to these receptors of any short-term exceedences in air quality standards would be Negligible (I). The rapid dispersion and dilution of air emissions expected will reduce the likelihood that air quality standards are exceeded or that seabirds are exposed to concentrated plumes of particulate matter from vessel exhaust points. Atmospheric emissions are not predicted to result in any impacts to local populations

of seabird species or any long-term disruption to their behaviour. While emissions add to GHG in the atmosphere, they are relatively small on a global scale, representing an insignificant contribution to overall GHG emissions. With the absence of nearby sensitive habitats (Legendre Island ~122 km away), consequences from the localised and temporary emissions are unlikely, and the overall risk from atmospheric emissions due to the activity is considered to be '*Very Low*' (1).			
Standard Control Measures Considered			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
MARPOL 73/78 Annex VI (Prevention of Air Pollution) and Marine Order 97.	Reduces likelihood of impacts to air quality due to emissions.	Control is a legislated requirement. Implementation of the regulations will reduce the atmospheric emissions released into the environment.	**Accept**
Combustion equipment maintained in accordance with PMS.	Combustion equipment maintenance will reduce atmospheric emissions released into the environment.	Good industry practice, environmental benefit outweighs cost.	**Accept**
Fuel use will be measured, recorded and reported for the survey vessel.	Abnormalities are detected and investigated early, reducing the possibility of increased emissions.	Good industry practice, environmental benefit outweighs cost.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
None identified			
ALARP Assessment			
The risk assessment and evaluation has identified a range of existing standard controls that when implemented are considered to manage the impacts and risks from atmospheric emissions. The activity cannot happen without vessels, and the combustion of conventional fuels is essential to undertaking the activity. Practical and reliable alternative fuel types and power sources for the survey vessel have not been identified.			

With the adoption of the standard industry controls, including legislative requirements and Marine Orders and the use of low sulphur diesel fuel, the residual risk from atmospheric emissions was assessed as '*Very Low*' (1), a Type A decision, and cannot be reduced further. With no additional or alternative control measures identified that would offer a net environmental benefit, the residual risk from atmospheric emissions generated during the activity is considered to be reduced to ALARP.		
Residual Risk Summary		
Consequence	**Likelihood**	**Residual risk**
Negligible (I)	Unlikely (D)	Very Low (1)
Demonstration of Acceptability		
Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?		Yes – risks are reduced to ALARP, and the residual risk ranking is 'Very *Low*' (1).
Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?		Yes – the activity was evaluated as having the potential to result in negligible consequence, and not result in serious or irreversible environmental damage.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?		Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?		Yes – requirements of MARPOL Annex VI and Marine Order 97 (Marine Pollution Prevention – air pollution) adopted.
Have stakeholder expectations been addressed?		N/A – no concerns raised.
The proposed controls meet or exceed the legislative requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and associated AMSA Marine Order 97 (Marine Pollution Prevention - Air Pollution) under the *Protection of the Sea (Prevention of Air Pollution) Act 1983* for the management of emissions at sea. The impact assessment has determined that, given the adopted controls, fuel combustion is unlikely to result in a impact greater than a temporary decrease in local air quality, with no consequences for human health or fauna. Potential sensitive receptors (seabirds) that may occur in the operational area are highly mobile and transient through the area; therefore, their exposure would be negligible. Stakeholders have been informed of the proposed activity, as detailed in **Section 5** and there are no concerns raised by stakeholders regarding this hazard/risk. With the control measures proposed, potential risks and impacts associated with atmospheric emissions were classified as '*Very Low*' (1), On		

this basis, it is considered that adherence to the environmental performance standards will manage the impacts and risks from atmospheric emissions to an acceptable level.			
Environmental Performance Outcomes, Standards and Measurement Criteria			
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**	**Responsibility**
Atmospheric emissions managed in accordance with the relevant legislative requirements and Marine Orders.	In accordance with MARPOL 73/78 Annex VI (Prevention of Air Pollution) and Marine Order 97:	HSE inspection confirms vessel holds a valid IAPP certificate.	Chief Engineer
	- Vessel complies with the requirements for ozone depleting substances (ODS), including no deliberate release of ODS.	HSE inspection confirms ODS Record Book (where applicable) is current and maintained in compliance with Annex VI.	Vessel Master
	- Fuel usage measured, recorded and reported.	Oil record book documents fuel usage.	
	All combustion equipment maintained in accordance with PMS (or equivalent).	PMS records verify combustion equipment maintained to schedule.	Chief Engineer

7.6 Routine Discharges

Planned Activity
The following activities were identified as having the potential to result in planned liquid releases to the marine environment: • Vessel operations.
Hazard Identification
The vessel will generate sewage, grey water, putrescible waste, bilge, cooling water and brine that will require discharge to the marine environment. During the activity, these discharges have the potential to impact: • Water quality; • Plankton; and • Marine fauna. **Sewage, grey water and putrescible waste** Total volumes of treated sewage and grey water (from the use of ablution, laundry and galley facilities) typically generated at offshore facilities ranges between 0.04 and 0.45 m^3 per person per day (EMSA, 2016; NERA, 2017). Assuming 15 people on the survey vessel, this equates to up to a maximum 6.75 m^3 of sewage and grey water discharged daily. The average volume of putrescible wastes produced is estimated at 1-2 kg/person/day (0.001-0.002 m^3; NERA, 2017). This equates to a maximum 0.03 m^3 of putrescible waste discharged daily. **Treated bilge water and deck drainage** Bilge water accumulates from closed deck drainage and machinery spaces. It can contain water, oils from machinery spaces or minor spills, detergents, solvents and other chemicals. Bilge water is treated onboard the vessel using the oily water separator (OWS) to reduce the discharge to below the regulated level of <15 ppm. If not treated, bilge water is retained onboard for disposal at an onshore facility. Deck discharges include water that goes directly overboard or via deck drainage systems. Water sources could include rainfall events and/or deck activities such as cleaning or wash-down of equipment/decks, and water may contain minor quantities of detergents, and oil and grease which has been spilled on the deck. **Cooling and brine water**

Seawater is used as a heat exchange medium for cooling machinery engines and other equipment. Seawater is drawn from the ocean and flows counter-current through closed-circuit heat exchangers, transferring heat from the vessel engines and machinery to the seawater. The seawater is then discharged to the ocean (i.e. it is a once-through system). Cooling water temperatures vary depending upon the vessel's engine workload and activity, but may be warmer than the ambient water temperature, and may contain low concentrations of residual biocide, used to prevent biofouling inside the heat exchangers. However, scale inhibitors and biocides used in the heat exchange and desalination process discharges are inherently safe because they are usually largely "consumed" in the inhibition process and there is only a low residual chemical concentration in the discharge stream.

Brine wastewater will be produced by the vessels' reverse osmosis desalination process that is required to generate freshwater for drinking, showers and cooking. The brine wastewater will have elevated salinity above ambient waters (~10%) which may also contain residual traces of anti-scalant (cleaning agent) used in the cleaning of the potable water supply system. The volume of brine solution discharged is dependent on the requirement for potable water and would vary dependent on the number of people onboard the vessel.

The environmental receptors that may be exposed to changes in water quality from these discharges include pelagic fish, marine turtles, cetaceans, seabirds and plankton in surface waters around the vessel.

Environmental risk relating to unplanned (non-routine/accidental) disposal/discharge of liquid waste is addressed in **Section 8.2**.

Environmental Impact Assessment

The changes in water quality as a result of routine discharges may include:

- Temporary localised decline in water quality;
- Localised increased turbidity in the water column which may temporarily inhibit photosynthesis by phytoplankton by decreasing light availability in surface waters;
- Temporary nutrient enrichment of surrounding waters potentially resulting in localised oxygen depletion and increased phytoplankton growth; and
- Temporary, localised elevated salinity and water temperature which may impact phytoplankton and sensitive marine fauna close to the source.

Sewage, grey water and putrescible waste

The main environmental impact associated with discharge of sewage and other organic wastes (i.e. putrescible waste) is eutrophication. Eutrophication occurs when the addition of nutrients, such as nitrates and phosphates, causes adverse changes to the ecosystem, such as oxygen depletion and phytoplankton growth. However, no significant impacts are expected from these discharges given the biodegradable nature of the waste, the small volumes released relative to the receiving environment's assimilative capacity, lack of nearby habitats sensitive to any nutrient increases, and the highly dispersive nature of the receiving ocean environment. The NWS is characterised as a highly productive ecosystem in which nutrients and organic matter are rapidly

recycled (Furnas and Mitchell, 1999); hence, the daily nutrient loadings are inconsequential in comparison to the daily turnover of nutrients that takes place. Based on these factors, the consequence of these discharges on the marine environment is considered to be Negligible (I).	

Treated bilge water and deck drainage
Discharges of oily water will be treated to <15 ppm in accordance with MARPOL Annex I and Marine Order 91 – Marine Pollution Prevention (Oil). Discharge of treated bilge or deck drainage is non-continuous and infrequent. Discharges could introduce low concentrations of hazardous substances (mixture of water, oily fluids, lubricants, cleaning fluids etc.) into the water column. In turn, this may result in a reduction in water quality, with potential impacts to pelagic organisms. However, potential impacts from toxicity effects would be limited to passive marine biota (i.e. planktonic organisms and fish larvae) that become entrained in the discharge plume; mobile marine fauna such as fish would be able to move away from the area of discharge. Due to the small volumes, the very low levels of contaminants likely to be entrained in the discharge and the rapid dilution and dispersal that will result at the oceanic location, the environmental effects will be temporary, localised and limited to the surface waters (<5 m). Therefore, the impacts to fauna in the water column from deck and bilge discharges are predicted to be localised with no ecosystem-level effects.
Cooling and brine water
Cooling water will be discharged at a temperature that may be above ambient seawater temperature. Upon discharge it will be subjected to turbulent mixing and transfer of heat to the surrounding waters. Effects of elevation in seawater temperature may include a range of behavioural responses in marine fauna. Protected marine fauna with the potential to be in the operational area (e.g. pygmy blue whales and whale sharks) are transient in nature so significant impacts are not expected. The majority of residual biocide (chlorine) will be neutralised within the cooling water systems, and the very low concentrations of chlorine in the cooling water discharges will be rapidly diluted by the prevailing current. Brine water will sink through the water column where it will be rapidly mixed with receiving waters and dispersed by ocean currents. As such, any potential for impacts is expected to be limited to immediately adjacent to the source of the discharge where concentrations are highest. This is confirmed by Azis et al. (2003) who reported that effects on planktonic communities in areas of high mixing and dispersion, such as those found in the operational area, are generally limited to the point of discharge only. Changes in salinity can affect the ecophysiology of marine organisms and larval stages tend to be more susceptible to impacts of increased salinity (Neuparth et al. 2002). However, some marine species are known to be able to tolerate short-term fluctuations in salinity in the order of 20%–30% (Walker and McComb 1990). The receptors with the potential to be exposed to an increase in salinity include pelagic fish species and plankton found in surface waters within the operational area. Pelagic megafauna species (e.g. whale sharks) may be subjected to slightly elevated salinity levels for a very short period if they swim through the area, but they are expected to be able to tolerate short-term exposure.

Given the short duration of the activity (up to ~14 days), relatively low discharge volumes and open ocean conditions resulting in rapid mixing, the change in water quality is expected to be temporary and highly localised, and not expected to result in any significant ecological impacts. The potential consequence on the marine environment is therefore considered to be Negligible (I).			
Summary			
Due to the short duration of the activity and the generally mobile and intermittent nature of these routine discharges, any detectable reductions in water quality within the operational area are expected to be localised and short-term with no lasting effect. Given the rapid dilution (and negligible exposure to concentrations above impact thresholds), direct impacts to transient marine fauna, including MNES (e.g. pygmy blue whales and whale sharks) are not expected, with direct impacts limited to planktonic organisms that may be entrained within the discharge plume. In view of the high level of natural mortality and the rapid replacement rate of plankton species (UNEP, 1985), the potential consequence on planktonic communities is a localised impact on plankton abundance in the vicinity of the point of discharge with negligible ecological significance. Given the open ocean location of the operational area, distance from sensitive receptors and relatively small discharge volumes, temporary reduction in water quality due to routine discharges and the effect on the marine environment is considered to have Negligible (I) ecological consequences.			
Standard Control Measures Considered			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Sewage will be managed in accordance with MARPOL Annex IV and AMSA Marine Order 96 (Marine pollution prevention – sewage).	Reduces potential impacts of inappropriate discharge of sewage. Provides compliance with legislated requirements.	Personnel cost in ensuring vessel systems(s) are in place during vessel contracting and in pre-mobilisation audits and inspections, and in reporting discharge levels. Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.	**Accept**
Onboard treatment system for oily water discharges.	Reduces potential impacts of planned discharge of oily water to the environment. Provides compliance with MARPOL Annex I and Marine Order 91 (Marine pollution prevention - oil).	Personnel cost in ensuring vessel certificates are in place during contracting and in pre-mobilisation audits and inspections, and in reporting discharge levels.	**Accept**

		Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time, and it is a legislated requirement.	
Use of macerator on the survey vessel is compliant with MARPOL Annex V and Marine Order 95	Reduces potential impacts of planned discharge of putrescible waste to the environment. Provides compliance with MARPOL Annex IV and Marine Order 95 (Marine pollution prevention - garbage).	Personnel cost ensuring compliance through audits and inspections. Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time.	**Accept**
Procedures in place to reduce the potential of deck spills reaching the marine environment.	Reduces potential impacts of planned discharge by ensuring toxicity is within legislative requirements,	Personnel cost ensuring compliance through audits and inspections. Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time.	**Accept**
PMS ensures efficient operation.	Maintenance will ensure equipment operating efficiently and according to manufacturer specifications.	Good industry practice, environmental benefit outweighs cost.	**Accept**
Deck cleaning and product selection.	Improves water quality discharge (reduced toxicity) to the marine environment.	Personnel costs of implementing, potential additional cost and delays of chemical substitution. Benefits of reducing potential toxicity outweigh the cost	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Zero discharge overboard.	Would eliminate potential impacts of contaminants discharged to sea.	Costs associated with containment and onshore disposal. Small discharge	**Reject**

<table>
<tr><td></td><td></td><td>volumes will meet legislated requirements and standard practice.</td><td></td></tr>
<tr><th colspan="4">ALARP Assessment</th></tr>
<tr><td colspan="4">Routine discharges during the activity are unavoidable and standard offshore industry practice in open waters. The risks and impacts to the marine environment are well understood. Given that all routine discharges will comply with relevant MARPOL legislation and Marine Orders, and involve relatively low volumes over a short period, there is a high level of certainty that effects on water quality will be temporary and localised to the location of discharge, due to the rapid dispersal of the waste streams in the offshore, open ocean environment.

SapuraOMV considers the adopted controls appropriate to manage the impacts of planned routine discharges. As no reasonable additional or alternative controls were identified that would further reduce the impacts without grossly disproportionate cost, the impacts and risks are considered ALARP. As such, the residual risk to the marine environment is predicted to be `Low' (2) and classified as a Type A decision.</td></tr>
<tr><th colspan="4">Residual Risk Summary</th></tr>
<tr><th>Consequence</th><th>Likelihood</th><th colspan="2">Residual risk</th></tr>
<tr><td>Negligible (I)</td><td>Likely (B)</td><td colspan="2">Low (2)</td></tr>
<tr><th colspan="4">Demonstration of Acceptability</th></tr>
<tr><td colspan="2">Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between 'Very Low' (1) to 'Medium' (3)?</td><td colspan="2">Yes – risks are reduced to ALARP, and the residual risk ranking is 'Low' (2).</td></tr>
<tr><td colspan="2">Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?</td><td colspan="2">Yes – the activity was evaluated as having the potential to result in negligible consequence, and not result in serious or irreversible environmental damage.</td></tr>
<tr><td colspan="2">Are the potential risks and hazards consistent with SapuraOMV's policy and standards?</td><td colspan="2">Yes – aligns with SapuraOMV's HSE Policy and HSEMS</td></tr>
<tr><td colspan="2">Have legislative and other requirements been met? Industry codes, standards and guidelines applied?</td><td colspan="2">Yes – management consistent with Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and relevant requirements including:
- MARPOL Annex IV and Marine Order 96 (Marine Pollution Prevention – sewage);</td></tr>
</table>

	- MARPOL Annex V and Marine Order 95 (Marine Pollution Prevention – garbage); and - MARPOL Annex I and Marine Order 91 (Marine Pollution Prevention – oil).
Have stakeholder expectations been addressed?	N/A – no concerns raised.

Planned routine discharges to the marine environment are considered to be standard practice in the industry and are subject to well established guidelines and regulations. The impact assessment has determined that, given the adopted controls, planned routine discharges are unlikely to result in a potential impact greater than localised and short-term impacts, which are not considered as having the potential to affect biological diversity, ecological integrity and have no lasting effect. The adopted controls are industry practice and meet legislative requirements under Marine Orders 91, 95 and 96.

Relevant conservation and management plans have been considered in the development of this EP (see **Section 4.4.1.1**). While some emissions and discharges have been listed as a threat, managing discharges in accordance with legislative requirements is consistent with the intent of the conservation management documents.

Stakeholders have been informed of the proposed activity (see **Section 5**), and no concerns have been raised regarding routine emissions. With the control measures proposed, the residual risk associated with planned routine discharges was assessed as `*Low'* (2). On this basis, it is considered that adherence to the environmental performance standards will manage the impacts and risks from routine operational discharges to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
Vessel discharges of sewage, grey water and food waste comply with legislated requirements for permissible discharges.	Sewage is managed in accordance with MARPOL Annex IV and AMSA Marine Order 96 (as appropriate to vessel class): • A valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class; • A MARPOL-approved sewage treatment plant (STP); • A sewage holding tank sized appropriately to contain all generated waste (black and grey water);	Vessel inspection confirms (as applicable): • Valid ISPP; • MARPOL-approved STP; and • Sewage holding tanks. Vessel logs demonstrate that all sewage discharges are compliant with MARPOL Annex IV and AMSA Marine Order 96.	Chief Engineer

	• Comminuted/disinfected sewage is only discharged when ≥3 nm from land and while vessel is moving >4 knots; and • Sewage that has not been comminuted/disinfected is only discharged when ≥12 nm from land and while vessel is moving >4 knots.		
	STP maintained in accordance with PMS.	Vessel inspection records.	Chief Engineer
		PMS records confirm that STP maintained to schedule.	Chief Engineer
	Food waste will be macerated to a particle size of <25 mm when discharged at a distance >3 nm from land.	Garbage Record Book.	Vessel Master
	Macerators are maintained as per the PMS to ensure they are functional.	PMS records confirm that the macerator maintained to schedule or repaired/replaced as required.	Vessel Master
Zero discharges of deck drainage and bilge water to the marine environment if oil-in-water content exceeds 15 ppm.	Compliance with Marine Order 91 – Marine Pollution Prevention – Oil (as appropriate to vessel class): • A valid International Oil Pollution Prevention (IOPP) Certificate; • Machinery space bilge/ oily water will pass through a MARPOL-	Vessel inspection confirms: • Valid IOPP; and • MARPOL-approved OWS.	Chief Engineer

	approved OWS to reduce oil-in-water content to <15 ppm prior to discharge while en-route; • Where the oil-in-water content exceeds 15 ppm, the oily water is contained on-board and disposed of at a licensed onshore facility or to a carrier licensed to receive waste; • Treated oily water will only be discharged when vessel en-route; and • The MARPOL-approved oil-water separator will be calibrated and maintained in accordance with the PMS.	Oil Record Book. PMS records.	
	Vessel will implement procedures to ensure deck drainage systems are in place and maintained (e.g. scupper plugs), to reduce the potential for deck spills reaching the marine environment.	Vessel inspection records.	Vessel Master
No substantial adverse effect on marine fauna from reduced water quality from detergents/cleaning agents	Detergents/ cleaning agents used onboard will be biodegradable and phosphate free.	Vessel inspection records verify biodegradable and phosphate free nature of detergents/ cleaning agents used.	Vessel Master

8. Environmental Assessment for Unplanned Events

SapuraOMV's environmental assessment identified six potential sources of environmental risk associated with unplanned events for this activity. The results of the environmental assessment are summarised in **Table 8-1**. The comprehensive risk and impact assessment for each of the unplanned events and subsequent control measures proposed by SapuraOMV to reduce the risks and impacts to ALARP are detailed in the following subsections.

Table 8-1 Summary of risk assessment ranking for unplanned events

Hazard	Consequence	Likelihood	Residual Risk
Section 8.1 – Hydrocarbon Spill – Vessel Collision			
Hydrocarbon spill from ruptured fuel tank from a vessel collision.	III (Moderate)	E (Remote)	2 (Low)
Section 8.2 – Minor Hydrocarbon or Chemical Spills			
Accidental hydrocarbon/chemical release.	II (Minor)	C (Possible)	2 (Low)
Section 8.3 – Solid Releases – Loss Overboard			
Accidental loss of solid hazardous/ non-hazardous waste/ dropped objects.	I (Negligible)	C (Possible)	2 (Low)
Section 8.4 – Marine Fauna Collision / Entanglement			
Vessel collision or entanglement with marine fauna that may be in operational area during the activity.	II (Minor)	D (Unlikely)	2 (Low)
Section 8.5 – Introduction of Invasive Marine Species			
Introduction of invasive marine species from the use of non-local vessels/ discharge of ballast water.	III (Moderate)	E (Remote)	2 (Low)
Section 8.6 Spill Response Operations			
Spill response activities including use of vessels, aircrafts, dispersants and/ or land-based operations.	III (Moderate)	E (Remote)	2 (Low)

8.1 Hydrocarbon Spill – Vessel Collision

Planned Activity
The following activities were identified as having the potential to result in hydrocarbon spill from a vessel collision: • Vessel operations – equipment failure, navigational error or poor weather conditions.
Hazard Identification
During the activity, a hydrocarbon spill of MDO from a ruptured fuel tank could occur in the event of an unplanned collision of the survey vessel and a passing third-party vessel. Given the water depths (~147 m), the offshore location of the operational area and the lack of emergent features nearby, vessel grounding is not considered a credible risk. While highly unlikely, a vessel collision resulting in a vessel fuel tank rupture is considered a credible scenario due to factors such as human error, poor navigation, vessel equipment failure or poor weather conditions. The maximum credible spill volume was determined based on AMSA's *Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities* (AMSA, 2015). The guidance states that for a vessel other than an oil tanker, the maximum credible spill from a vessel collision can be determined from the volume of the largest single fuel tank. The loss of a full tank is most likely an overestimate as hydrostatic pressure would limit the release and pumping of material to another tank could also restrict the amount lost. In reviewing the general arrangements and fuel tank capacities of typical vessels likely to be utilised for this activity, a conservative value for the largest single fuel tank capacity was determined to be 200 m^3. Therefore, the extent of possible exposure to hydrocarbons is based upon a hypothetical worst-case 200 m^3 surface release of MDO. The rate at which MDO could spill to the marine environment is largely dependent upon the position of the fuel tanks and the extent of tank damage. For the purpose of the environmental impact and risk assessment it was assumed that the MDO discharge following a fuel tank rupture will be an instantaneous discharge over 0.5 hours. For a vessel collision to result in the worst-case scenario of a hydrocarbon spill potentially impacting an environmental receptor, several factors must align as follows: • The vessel interaction must result in a collision; • The collision must have enough force to penetrate the vessel hull; • The penetration must be in the exact location of the fuel tank; • The fuel tank must be full, or at least of volume which is higher than the point of penetration; and • The full volume of the tank must be released to the marine environment (i.e. no effective source control).

Environmental Impact Assessment

An accidental MDO release to the marine environment has the potential to impact:

- Water quality;
- Marine fauna; and
- Socio-economic receptors.

Marine Diesel Oil

MDO Characteristics

Diesel oils are generally considered to be readily degraded by naturally occurring microbes. Marine diesel is a medium-grade, moderately-persistent oil (classified as a Group II oil) used in the maritime industry. It is a mixture of volatile and persistent hydrocarbons with low percentages of highly volatile and residual components. When exposed to the atmosphere, around 40% of the mass would be expected to readily evaporate (volatiles and semi-volatiles) (**Table 8-2**). In the marine environment, MDO is expected:

- To spread rapidly in the direction of the prevailing wind and waves;
- To evaporate from the sea surface (~25-50% of the net spill balance); and
- Disperse as oil droplets in the upper layers of the water column and undergo microbial degradation.

Table 8-2 Marine diesel characteristics

Density (kg/m^3)	Volatiles (%) <180 C4-C10	Semi-volatiles (%) 180-265 C11-C15	Low volatility (%) 265-380 C16-C20	Residual (%) >380 >C20	Aromatics Of whole oil <380
	Non-Persistent			Persistent	
836.8 @ 15°C	6	34.6	54.4	<5	3

Prevailing wind speeds can and do influence the weathering and fate of diesel. Due to its chemical composition, a substantive portion (~25-50%) of the MDO spill will generally evaporate between 12 hours and 5 days, depending on prevailing conditions (see modelling results below; GHD, 2020).

Modelling Inputs

To determine the risk area (i.e. the combined spatial extent of all simulations), modelling was performed on a surface release of 200 m^3 of MDO of 0.5 hour duration with 120 replicate simulations (or realisations) at any time of year staggered over a five-year extent of environmental data to represent the seasonal and inter-annual variability in environmental conditions.

Contact thresholds applied for shoreline, surface (floating) hydrocarbons, total submerged oil and dissolved oil used in the modelling study are summarised in **Table 4-1**. The extent of potential hydrocarbon contact at moderate and low thresholds is presented in **Figure 4-1.**

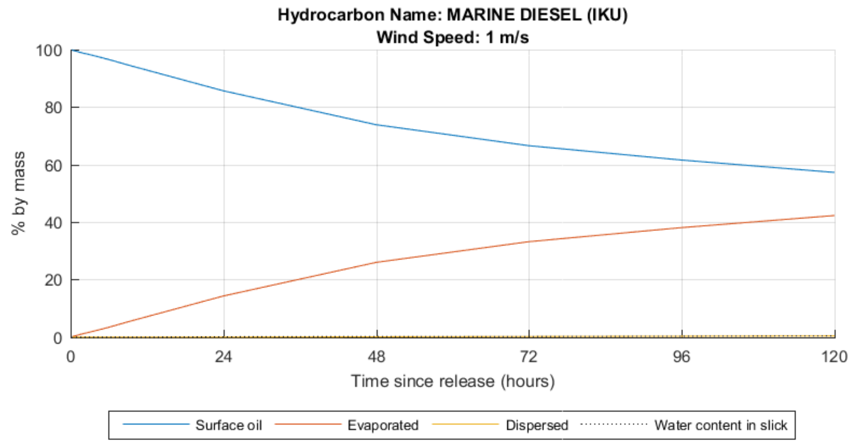
Marine Diesel (IKU) was selected from SINTEF's oil library as a suitable analogue to represent MDO for the oil spill modelling. The key parameters and the bulk properties of the MDO analogue (SINTEF's *Marine Diesel IKU*) used for the MDO spill modelling are listed below:

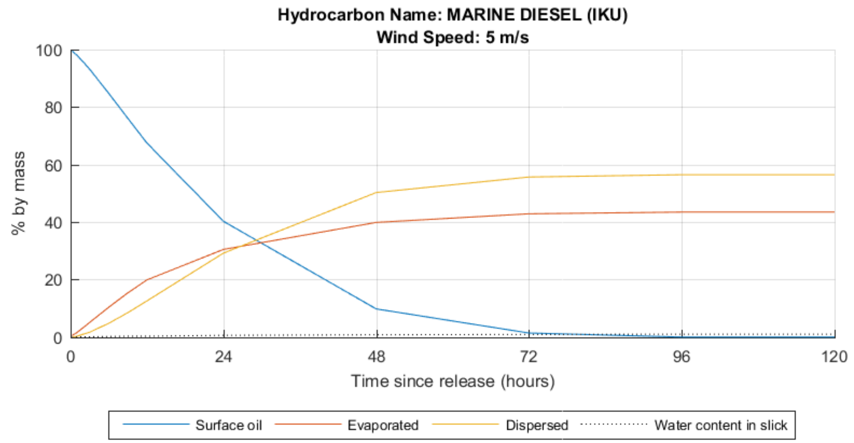
- API gravity: 0.843;
- Pour point: -36 °C;
- Specific gravity: 36.4
- Wax Content: 0.05%
- Viscosity @ 20 °C: 3.9 cP
- Duration of spill: 0.5 hour release;
- Depth of release: surface;
- Water depth at release location: 147 m;
- Volume of hydrocarbon: 200 m^3; and
- Time of year: any month of the year.

MDO Spill Modelling Results

Weathering Assessment

Figure 8-1 provides the simulated weathering results (GHD 2020) for a MDO spill released instantaneously onto the sea surface under constant 1 m/s (low winds), 5 m/s (moderate winds) and 10 m/s (high winds). With 1 m/s winds, 60% of the surface slick is predicted to remain after 120 hours (5 days). Under moderate winds, 40% of the initial surface slick is predicted to remain after 24 hours, decreasing further to ~10% after 48 hours and ~1% after 72 hours. With high winds (10 m/s), the surface slick is predicted to have been almost entirely evaporated and dispersed after 12 hours. The hydrocarbon has a very low tendency for emulsion formation, with only ~1% water content entrained into the surface slick after 120 hours for all wind conditions assessed.


Hydrocarbon Name: MARINE DIESEL (IKU)
Wind Speed: 1 m/s
% by mass
Time since release (hours)
Surface oil
Evaporated
Dispersed
Water content in slick


Hydrocarbon Name: MARINE DIESEL (IKU)
Wind Speed: 5 m/s
% by mass
Time since release (hours)
Surface oil
Evaporated
Dispersed
Water content in slick

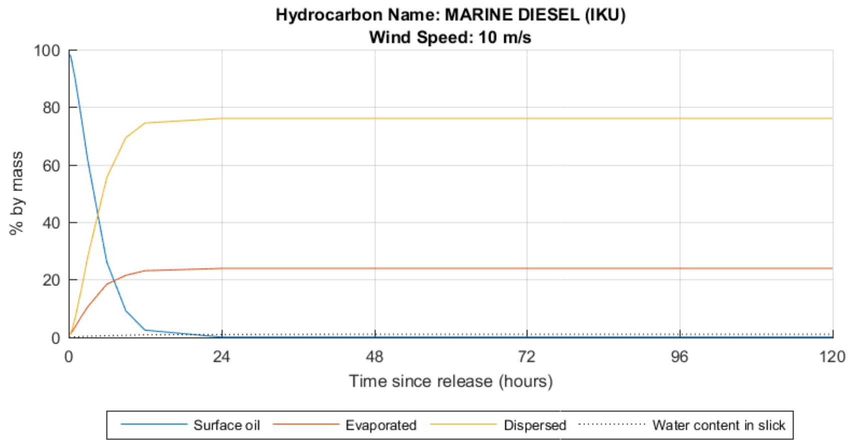


Figure 8-1 Simulated weathering assessment of the SINTEF Marine Diesel (IKU) hydrocarbon for constant wind speeds of 1 m/s (top), 5 m/s (middle and 10 m/s (bottom

The modelling results are presented below, for the fate of hydrocarbons at the contact threshold values defined in **Table 4-1** for the MEZ. Additional parameters required to inform spill response strategies are described further in the OPEP.

<u>Stochastic Results Summary</u>

Sea Surface Hydrocarbons above 10 g/m^2 (lower limit for potential ecological impacts)

Surface oil above the MEZ contact threshold (10 g/m^2) was predicted to extend up to ~150 km from the spill location, primarily travelling westerly to southwesterly, northerly and easterly with minimal transport to the south (towards the mainland).

No geographic features (i.e. shorelines), State or Australian Marine Parks were predicted to be contacted by floating oil at the MEZ threshold (10 g/m^2). Low to moderate probability (24%) of the spill reaching the KEF of the Ancient coastline at 125 m depth contour was predicted, though this is recognised for benthic habitats associated with seafloor features that would not be contacted by surface oil. Nonetheless, the maximum time-averaged oil concentration at the Ancient Coastline is 296 g/m^2 with a short minimum arrival time of 0.1 days (2 hours). A low contact probability of 8% was also predicted at the Continental Slope Demersal Fish Communities (also a seafloor feature) with a maximum time-averaged concentration of 29 g/m^2 and minimum arrival time of 3.2 days.

Total Submerged Oil 100 ppb (as appropriate given oil characteristics for informing risk evaluation)

Total submerged oil above the MEZ contact threshold (100 ppb) was predicted up to ~130 km from of the spill location.

At the MEZ contact threshold (100 ppb), a moderately low contact probability of 25% was predicted for the Ancient Coastline KEF with maximum time-averaged concentration of 1,050 ppb and short minimum arrival time of 0.1 days (2 hours). Low contact probabilities were predicted at two other KEFs, namely Continental Slope Demersal Fish Communities (2%) and Glomar Shoals (1%) with maximum time-averaged concentrations of 235 and 110 ppb, respectively, and minimum arrival times of 2.3 and 4.4 days, respectively. These KEFs are recognised for benthic habitats associated with their seafloor features. Exceedances of the MEZ contact threshold occur in the upper portions of the water column.

Dissolved Oil (50 ppb) (potential sub-lethal toxic effects)

Dissolved hydrocarbons at the MEZ contact threshold (50 ppb) were predicted up to ~130 km to the southwest and ~80 km to the northeast. There were no predicted exceedances of the NOPSEMA (2019a) high threshold (400 ppb) during any of the stochastic realisations.

At the MEZ threshold (50 ppb), moderately low contact probability was predicted at the Ancient Coastline KEF (25%) with a maximum time-averaged concentration of 396 ppb and short minimum arrival time of 0.1 days (2 hours). A very low contact probability (2%) was also predicted at the Continental Slope Demersal Fish Communities KEF with a maximum time-averaged concentration of 100 ppb and a minimum arrival time of 2.3 days. These KEFs are recognised for benthic habitats associated with their seafloor features. Exceedances of the MEZ contact threshold occur in the upper portions of the water column.

Hydrocarbons Ashore above 100 g/m^2 (generally requiring clean-up effort)

There were no instances of shoreline oiling predicted at any threshold (including that of the 100 g/m^2 for the MEZ) during any of the 120 stochastic realisations.

Ecological and Socio-economic Impacts of Diesel Spills

Hydrocarbon spills will cause a decline in water quality and may cause chemical (e.g. toxic) and physical (e.g. oiling of wildlife at sea surface) impacts to marine species. The severity of the impact of a hydrocarbon spill depends on the magnitude of the spill (i.e. extent, duration) and sensitivity of the receptor. Weathering will also be an important factor in determining impacts on wildlife. Individuals oiled early in a spill may be exposed to the more toxic components of the oil by direct contact and ingestion and suffer greater toxicity than those affected by a more weathered oil. However, the thermoregulatory problems for oiled wildlife would be similar.

A surface release of diesel to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column near the location of the spill, and waters below 10 m water depth are unlikely to be affected by entrained and dissolved hydrocarbons (NERA, 2018). Based on modelling predictions, no oil will reach shorelines; however, transient marine fauna traversing the area may be potentially impacted by a spill.

Table 8-3 Potential impacts to sensitive receptors found within the MEZ

Receptor	Potential Impact
Marine Fauna	
Plankton	There is potential for localised mortality of plankton due to reduced water quality and toxicity from dissolved and entrained hydrocarbons. Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest. Relatively low concentrations of hydrocarbons can be toxic to plankton (including zooplankton) and fish eggs and larvae. Plankton risk exposure through ingestion, inhalation and dermal contact. Plankton are numerous and widespread but do act as the basis for the marine food web, meaning that an oil spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Once background water quality conditions have been re-established, the plankton community may take weeks to months to recover (ITOPF, 2011), due to fast population turnover. The actual area affected by any single spill event would be considerably smaller than the area represented by the MEZ or EMBA, which are defined spatially on the basis of 120 simulations (or realisations) of a 200 m^3 MDO spill. Given the relatively small MEZ and the fast population turnover of open water planktonic populations it is considered that any potential impacts will be low and temporary in nature.
Marine Mammals	No critical habitats or aggregation areas (feeding, breeding, resting) for cetaceans have been identified within the MEZ or adjacent waters. There is overlap with the distribution and migration BIA for pygmy blue whales (**Figure 4-8**); however, it is expected that their presence will be in low numbers, as individuals transit through the area, with possible higher numbers during peak migration times (see **Table 4-10**). Marine mammals that have direct physical contact with surface slicks could potentially ingest oil or become coated with diesel while surfacing to breathe, causing exposure of eyes and mucous membranes which may result in irritation. Cetaceans have mostly smooth skins, and as oil tends to adhere to rough surfaces, contact with oil by cetaceans may cause only minor oil adherence and would likely quickly wash-off the dorsal surfaces as they dive into deeper waters. Direct consumption of petroleum hydrocarbons is considered highly unlikely in whales and dolphins, and any quantity consumed is not likely to have any direct effect upon the individual (Pidcock et al. 2003). There is the potential for volatile hydrocarbons to be inhaled if cetaceans were to surface within a MDO surface slick especially if this occurred close to the spill area where the hydrocarbons would be relatively fresh (i.e. have a greater concentration of volatile monocyclic aromatic hydrocarbons (MAHs) such as benzene, toluene, ethylbenzene and xylene). Marine mammals are highly mobile and may exhibit avoidance behaviour and move away from the spill-affected area. Given their mobility and the relatively small area over which fresh diesel would be present, only a small

	proportion of the population would be expected in the affected area, resulting in short-term and localised consequences, with no long-term effects on population viability. The likely biological consequences of physical contact with surface hydrocarbons is expected to be in the form of irritation and sub-lethal stress. As the zone of sea surface contact above the 10 g/m^2 ecological impact threshold is relatively small and MDO undergoes rapid dispersion and evaporation, impacts to marine mammals as a result of hydrocarbon exposure are unlikely to lead to long-term impacts, and potential impacts would be limited to individuals transiting the area. The Blue Whale Conservation Management Plan 2015-2025 (DoE, 2015a) assesses exposure to acute chemical discharge, such as from accidental oil or condensate spills from oil rigs and other at sea operations, as a minor consequence which is defined as individuals are affected but no affect at population level.
Marine Reptiles	The MEZ overlaps an internesting buffer for flatback turtles (**Figure 4-9**). However, given the internesting buffer is 60 km from the nesting beach, the number of marine turtles that may be exposed to surface diesel is expected to be low. A study that investigated flatback turtle internesting behaviour found that the 30 m depth contour encompassed the vast majority of internesting activities (i.e., resting on the seabed) (Pendoley, 2017). Another study by Whittock et al. (2016) identified suitable internesting habitat for flatbacks to be between 0 and 16 m deep and within 5 to 10 km off the coastline. These studies demonstrate that, while marine turtles may be present in offshore waters during the internesting period, they typically remain closer to shore and in shallower waters than the MEZ overlaps. Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon slicks (Odell and MacMurray, 1986). Contact with surface slicks, or entrained hydrocarbons, can therefore result in hydrocarbon adherence to body surfaces (Gagnon and Rawson, 2010) causing irritation of mucous membranes in the nose, throat and eyes leading to inflammation and infection (NOAA, 2010). However, MDO is unlikely to stick to turtles in large amounts due to their smooth surfaces, and would likely wash off. Hydrocarbons in surface waters may also impact turtles when they surface to breathe and inhale toxic vapours (e.g. close to the spill source). Ingestion and inhalation of hydrocarbons is only expected to occur to animals in the immediate vicinity of the release location, given the weathering characteristics of marine diesel. The Recovery Plan for Marine Turtles in Australia (DoEE, 2017a) highlights acute chemical discharge as one of several threats to marine turtles. Given the small predicted spill area and the mobile nature of turtles this is unlikely to affect significant numbers, and potential impact would be limited to individuals. Impacts to sea snakes from direct contact with surface hydrocarbons are likely to result in similar physical effects to those recorded for marine turtles. In general, sea snakes frequent the waters of the continental shelf area, around offshore islands and potentially submerged shoals (water depths <100 m) and while individuals may be present in the MEZ, their abundance is not expected to be high, given the deep water and offshore location of the activity.

	Sharks, Rays and Fish	The NWS supports a diverse assemblage of fish, particularly in shallower water near the mainland and islands, which are not present in the MEZ. The EPBC Protected Matters search identified a number of shark, ray and sawfish species that may be present in the MEZ (**Table 4-2**). However, given the absence of critical habitat for all of these species, significant numbers are not expected to be impacted. Entrained hydrocarbon droplets can physically affect fishes and elasmobranchs (sharks and rays) exposed for an extended duration (weeks to months). Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest. Smothering through coating of gills can lead to the lethal and sub-lethal effects of reduced oxygen exchange, and coating of body surfaces may lead to increased incidence of irritation and infection. Fish may also ingest hydrocarbon droplets or contaminated food leading to reduced growth. Near the sea surface, fish are able to detect and avoid contact with surface slicks and as a result, mortality rarely occurs in open waters from surface spills (Kennish, 1997; Scholz et al.1992). Pelagic fish species are therefore generally not highly susceptible to impacts from hydrocarbon spills. Fish populations are likely to be distributed over a wide geographical area so impacts on populations or species level are considered to be negligible. Hydrocarbon contact may affect whale sharks through direct physical coating (surface slicks) and ingestion (surface slicks and entrained/dissolved hydrocarbons), particularly if feeding. Whale sharks are vulnerable to surface, entrained and dissolved aromatic hydrocarbon spill impacts, as they filter large amounts of water over their gills, catching planktonic and nektonic organisms (Jarman and Wilson, 2004). Large amounts of ingested hydrocarbons may affect their endocrine and immune system in the longer term. Whale sharks may also be affected indirectly by surface, entrained or dissolved aromatic hydrocarbons through the contamination of their prey, which may result in long-term impacts as a result of bioaccumulation. While a whale shark BIA overlaps the MEZ, it is not for high density foraging where congregations are expected, so impacts would be limited to transient migrating individuals and significant impacts to whale sharks are not expected. Individuals that have direct contact with hydrocarbons within the spill affected area may be impacted, but the consequences to migratory whale shark populations will be minor.
	Marine Birds	Eleven threatened and/or migratory species, as identified by the EPBC Protected Matters database search, may be present in the MEZ (**Table 4-2**). The only BIA identified was the Wedge-tailed shearwater breeding BIA (**Table 4-4**). In the unlikely event of a large diesel spill, there is the potential for seabirds to be exposed to surface, entrained and dissolved hydrocarbons. This could result in lethal or sub-lethal effects. Seabirds are vulnerable to contacting surface slicks during rafting, resting, diving or feeding at sea, particularly as they do not generally exhibit avoidance behaviour to floating hydrocarbons.

	Physical contact of seabirds with surface slicks is by several exposure pathways, primarily, immersion, ingestion and inhalation. In addition, it is possible that breeding individuals could come into contact with surface or entrained hydrocarbons while foraging (dive and skim feeding). Such contact with hydrocarbons may result in plumage fouling and hypothermia (loss of thermoregulation), decreased buoyancy and potential to drown, inability to fly or feed, anaemia, pneumonia and irritation of eyes, skin, nasal cavities and mouths (AMSA, 2020; IPIECA, 2004). Acute or chronic toxicity impacts (death or long-term poor health) to birds are possible but unlikely for a diesel spill as the number of birds would be limited due to the small area and brief period of exposure above 10 g/m^2. Therefore, potential impact would be limited to individuals and not at a population level.
Key Ecological Features	
Ancient Coastline at 125 m Depth Contour	KEFs overlapping the MEZ are described in **Section 4.4.4**. The values and sensitivities of the KEFs are generally related to benthic habitats and communities which support areas of enhanced diversity and productivity. A loss of MDO to the marine environment would result in a localised reduction in water quality in the upper water column and therefore impacts to the habitats of the KEFs are considered unlikely.
Continental Slope Demersal Fish Communities	
Glomar Shoals	
Socio-economic Receptors	
Commercial Fisheries	MDO in the water column can have toxic effects on fish (as outlined above) reducing catch rates and rendering fish unsafe for consumption. However, the relatively small MEZ and temporary nature of the predicted marine diesel spill in the upper layers of the water column would not likely lead to significant exposure of pelagic fish to contamination. Given these pelagic species are distributed over a wide geographical area, the impacts at the population or species level are considered very minor in the unlikely event of a marine diesel spill. Both water column and surface MDO have the potential to lead to temporary financial losses on commercial fishing operators if they were planning on undertaking fishing within the area of the spill.
Shipping	Vessels may be present in the area where sea surface oil is present; however, due to the short duration of the surface exposure and discrete slick created by an episodic release from a fuel tank rupture, disruption of shipping traffic would be unlikely.
Tourism	In the waters within and immediately surrounding the operational area, tourism activities are expected to be low, hence impacts to tourism would likely be low.
Oil and Gas Activity	In the event of a tank rupture incident, the short duration of a slick and associated response activities are unlikely to materially reduce access or lead to delays to the work schedules of other proximal oil and gas operators. Impacts to other oil and gas operators are therefore considered unlikely and minor.

Standard Control Measures Considered			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Survey vessel will be fitted with lights, signals, AIS transponders and navigation and communications equipment, as required by the *Navigation Act 2012*.	Vessel navigational aids and communication equipment will enable other marine users aware of their presence and position, to reduce and reduces likelihood of a collision.	Benefit outweighs the cost. Control is standard practice.	**Accept**
AHO will be informed of the proposed survey operational area prior to the activity commencing.	Notification to AHO will enable them to generate navigation warnings (i.e. Notice to Mariners).	Benefit outweighs the cost. Control is standard practice.	**Accept**
Notification to AMSA's JRCC.	Notification to AMSA JRCC will enable promulgation of radio-navigation warnings.	Benefit outweighs the cost. Control is standard practice.	**Accept**
Consultation with relevant stakeholders.	Communicating information about the activity to other marine users ensures they are informed and aware, thereby reducing the likelihood of interactions occurring.	Benefit outweighs the cost. Control is standard practice.	**Accept**
Vessel spill response plans (SOPEP/SMPEP, appropriate to class).	Potential impacts to the environment are reduced through effective management of an accidental spill (minimised discharge to sea).	Personnel cost associated with ongoing management (spill response exercises) and implementation of plans. Benefits of ensuring response	**Accept**

		plans in place, are followed and implemented outweighs costs.	
Constant bridge watch	Crew will maintain constant bridge watch thereby reducing the likelihood of a third-party vessel approaching too close.	No additional costs. Control is standard practice.	**Accept**
OPEP	Demonstrates the capability and planned response strategies to spills in the marine environment. May help to reduce the potential impact on the environment.	Under the OPGGS(E)R, NOPSEMA require that the petroleum activity have an accepted OPEP. Benefits of ensuring procedures are developed outweigh administration and preparation costs. Control is a legislated requirement and must be adopted.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Adjust the activity schedule to occur entirely outside of sensitive periods (e.g. whale or whale shark migrations).	Adjusting the activity schedule to avoid sensitive periods for marine fauna adjacent to the operational area may reduce risk of impacts from exposure to MDO in the event of a vessel collision.	Variation of timing of specific activities is not feasible as the activity is subject to schedule constraints and vessel availability. Significant cost and schedule impacts if activities avoid specific timeframes.	**Reject**
Require survey vessel to be double hulled.	Reduces the likelihood of a loss of MDO in the highly unlikely event of a vessel collision,	Vessels are subject to availability and are required to meet SapuraOMV's standards	**Reject**

	minimising potential environmental impact.	during activities; requirement of a double hull on vessels would limit the number available. Given the low probability of such an event, the costs are grossly disproportionate to the benefit.	
Only MGO or MDO used on survey vessels (no heavy fuel oil (HFO) or intermediate fuel oil (IFO)).	In the unlikely occurrence of a vessel collision, MDO is a less persistent hydrocarbon than HFO or IFO. Likelihood does not change, but consequence rating is reduced due to a less persistent hydrocarbon.	Provides environmental benefit that is not disproportionate to the cost.	**Accept**
Survey vessel's individual tanks will contain no more than 200 m^3 of MDO each at any one time.	Limits the potential extent of impacts in the event of release of entire tank. Reduces response resource requirements to effectively implement measures to reduce impacts in the event of a spill, as described in the OPEP.	Possibly restricts vessel availability and increases costs due to reduced competitive pressures. Additional costs associated with ensuring vessels are compliant. Benefits considered to outweigh the costs.	**Accept**

Assessment of Likelihood

Det Norske Veritas (DNV) (AMSA, 2011) indicates that for the period 1982–2010, there were no spills over one tonne (1 m^3) for offshore vessels caused by collisions. The same DNV (AMSA, 2011) report also states that the total oil spill frequency (per ship year) due to ship collision of small vessels (similar to the survey vessel) is 1.2 E-4 (0.00012). The closest shipping fairway is ~48 km to the east, and little to no vessel activity in the operational area. The likelihood of two vessels colliding and one of them losing an entire tank volume of fuel is remote given the set of mitigation and management controls in place and that the incident has occurred rarely in the industry.

ALARP Assessment

There are no alternatives to the use of a vessel to undertake the activity. Vessel activities are well regulated, and control measures implemented across the offshore industry. The probability of the events aligning to result in a breach of fuel tanks resulting in a spill that could potentially affect the marine environment is considered Remote (E). Impacts to environmental and socio-economic receptors that could potentially result from a spill of this size would be Moderate (III), with impacts restricted to a small number of individuals and not at a population level. Further opportunities to reduce impacts have been investigated with two additional controls accepted. The residual risk was assessed as '*Low*' (2) and classified as Type A decision. Therefore, SapuraOMV considers the adopted control measures appropriate to manage the risk of an MDO spill from a vessel collision to the marine environment and the impacts and risks are considered to be ALARP.

Residual Risk Summary		
Consequence	**Likelihood**	**Residual risk**
Moderate (III)	Remote (E)	Low (2)

Demonstration of Acceptability	
Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?	Yes – risks are reduced to ALARP, and the residual risk ranking is 'Low' (2).
Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?	Yes – the activity was evaluated as having the potential to result in moderate consequence and is not considered as having the potential to result in serious or irreversible environmental damage. Two additional controls will be implemented to further reduce the risk of impact. Therefore, the activity does not compromise the relevant principles of ESD.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?	Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?	Yes – management consistent with: • Marine Order 21 (Safety and emergency procedures); • Marine Order 30 (Prevention of collisions); • Marine Order 91 (Marine pollution prevention – oil); and • *Navigation Act 2012*

	Oil spill impacts are not predicted to: • Impact the recovery of pygmy blue whales as per the Blue Whale Conservation Management Plan 2015 – 2025 (DoE, 2015b); • Impact the recovery of whale sharks as per the Conservation Advice (*Rhincodon typus*) whale shark (TSSC, 2015d); and • Impact the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a).
Have stakeholder expectations been addressed?	N/A – no concerns raised.

Several conservation management and recovery plans (**Section 4.4.1.1**) identify oil or chemical spills as key threatening processes, through direct/acute impacts, as well as indirect impacts through habitat degradation. The prevention of loss of containment events and reducing impacts to the marine environment through the spill response preparedness controls in place demonstrates alignment with the various plans. The proposed spill response strategies, see **Section 8.6** (Spill Response Operations), consider relevant values and include completion of a NEBA (Appendix A in the OPEP) in the event of a spill which includes the relevant values and receptors present in the area.

The proposed control measures are considered to be consistent with legislation, good oilfield practice/ professional judgement and environmental best practice. The activity has been evaluated in accordance with SapuraOMV's HSE Policy objectives and SapuraOMV is satisfied that with the implementation of industry-standard and activity-specific control measures to reduce the likelihood of a diesel spill event (and minimise impacts), and the residual risk is assessed to be '*Low*' (2) . Stakeholders have been informed of the proposed activity, and no concerns have been raised (**Section 5)**. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of an MDO spill to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
No release of hydrocarbons to the marine environment.	The AHO will be notified no less than four working weeks before operations commence for the	Email records confirm AHO notified in the required timeframe prior to commencement of operations.	SapuraOMV Senior HSE Specialist

	promulgation of related notices to mariners.		
	Notification will be provided to AMSA JRCC for promulgation of radio-navigation warnings 24-48 hours before operations commence, including following information: • Vessel details, including name, call sign and Maritime Mobile Service Identity (MMSI) ; • Satellite communications details, including INMARSAT-C and satellite telephone; - Area of operation; - Requested clearance from other Vessels; and - Notification of operations start and end.	Email records confirm AMSA notified in the required timeframe prior to commencement of operations.	Vessel Master SapuraOMV Senior HSE Specialist
	Survey vessel will be fitted with lights, signals, AIS transponders and navigation and communications equipment, as required by the *Navigation Act 2012*.	Records confirm that required navigation equipment is fitted to survey vessel to ensure compliance with the *Navigation Act 2012*.	Vessel Master

	Consultation ongoing with all relevant persons on an as required basis during the activity.	Ongoing consultation records maintained in SapuraOMV Stakeholder Database, including assessment of feedback and SapuraOMV response.	SapuraOMV Senior HSE Specialist
	Vessel will have current MARPOL-compliant SOPEP/SMPEP (as appropriate to vessel class) and tested in accordance with the training matrix.	Vessel inspection records confirm valid SOPEP/SMPEP.	Vessel Master
		Vessel inspection records confirm SOPEP/SMPEP tested as per schedule.	
	A 24-hour visual, radio and radar watch maintained.	Vessel log book	Vessel Master
	In the event of a hydrocarbon spill to sea, OPEP requirements implemented to mitigate environmental impacts.	Incident report	Incident Commander

8.2 Minor Hydrocarbon or Chemical Spill

Planned Activity
The following activities were identified as having the potential to result in minor hydrocarbon or chemical spills: • Vessel operations; and • ROV operations (if required).
Hazard Identification
The activity will require the handling, use and storage of chemicals and hydrocarbon materials, which may include, but are not limited to, hydraulic fluids, lubricant oils, waste oils, cleaning and cooling agents and solvents. Unplanned releases may occur from the following: • Mechanical failure of equipment (e.g. cranes and lifting equipment on deck); • Container/ tank/ pipework leak, hose or connection failure or rupture either on deck or from subsea equipment (e.g. ROV); • Incorrect storage or inadequate bunding of hydrocarbons and chemicals; and • Poor handling or human error (e.g. dropped containers). The survey vessel will contain and store hydrocarbons/chemicals in various small volumes. Storage areas are typically set up with effective primary and secondary bunding to contain any deck spills. Releases from equipment are predominantly from the failure of hydraulic hoses, which can either be located within bunded areas or outside of bunded or deck areas (e.g. subsea during survey activities). The maximum worst-case surface spill of hydrocarbons/chemicals is limited to the volume of individual containers, and unlikely to be greater than 0.16 m^3 (1 bbl drum size). Equipment deployed overboard during survey activities (e.g. ROV operations) can result in unplanned discharges (of hydraulic fluids) directly to the marine environment due to equipment failure. The largest credible hydrocarbon spill from ROV operations would be an accidental release of approximately 0.03 m^3 (30 L) of hydraulic fluid from the deployed ROV. The duration of a spill may last several minutes for small deck-based spills, or longer for a leak from subsea equipment, based on detection time plus time to initiate isolation of the spill/leak source. The susceptibility of marine fauna to hydrocarbons is dependent on hydrocarbon type and exposure duration; however, given that exposures would be limited in extent and duration, exposure to marine fauna from this hazard is considered to be low. Given the small volumes of worst-case releases, potential impacts to receptors from etiher a surface or subsea release will decline rapidly with time and distance. For environmental impacts of planned discharges, refer to **Section 7.6**; and for impacts from dropped objects refer to **Section 8.3.**

Environmental Impact Assessment
Minor hydrocarbon or chemical spills have the potential to impact: • Water quality; • Pelagic marine fauna; and • Plankton. The accidental minor release of hydraulic fluids or chemicals to the marine environment may result in a localised reduction in water quality, restricted to the immediate area close to the source of the spill or leak. Hydraulic fluids or chemicals spilt overboard have the potential to result in toxicity effects to marine fauna in the immediate vicinity of the spill release location, through direct contact or accidental ingestion. However, given the small potential release volumes and rapid dispersion that will occur in the offshore open ocean environment (and negligible exposure to hydrocarbon concentrations above impact thresholds), acute or chronic effects to MNES (e.g. pygmy blue whales and whale sharks) and transient marine fauna are not expected, with direct impacts limited to planktonic organisms that are unable to avoid or move through the small spill area. In view of the high level of natural mortality and the rapid replacement rate of many plankton species (UNEP, 1985), the potential consequence on planktonic communities is a temporary and localised impact on plankton abundance in the vicinity of source of the spill or leak, with negligible ecological significance. No definitive evidence of long-term effects on marine fauna from small marine oil spills has been identified (Dicks, 1998). No impacts on socio-economic receptors are expected due to the low levels of fishing activity in the operational area, the small volumes of hydrocarbons/chemicals that could be accidentally spilled, and the localised and temporary nature of the impacts. Given the adopted controls, it is considered that minor hydrocarbon or chemical spills to the marine environment will not result in a potential impact greater than a localised effect with no significant impact to environmental receptors or as having the potential to result in serious or irreversible environmental damage.

Standard Control Measures Considered			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Vessel spill response plans (SOPEP/SMPEP, appropriate to class).	Potential impacts to the environment are reduced through effective management of an accidental spill (discharge to sea).	Personnel cost associated with ongoing management (spill response exercises) and implementation of plans. Benefits of ensuring response plans in place, are followed and implemented outweighs costs.	**Accept**

Secondary containment for hazardous materials	Containment of hydrocarbons and chemicals onboard in event of spill/leak to prevent loss overboard.	Good industry practice that storage of hydrocarbons and chemicals are adequately contained. Costs outweigh the benefits.	**Accept**
Spill kits and scupper plugs available on board the vessel.	Should a spill occur on deck, spill kits and scupper plugs can prevent the spill from entering the marine environment.	Good industry practice. Minimal cost. Benefits outweigh costs.	**Accept**
General chemical handling procedures – SDS.	Potential impacts to the environment are reduced through following correct procedures for the safe handling and storage of chemicals.	Standard industry practice. Personnel costs associated with ensuring procedures are in place and implemented. Benefits outweigh the costs of personnel time.	**Accept**
Planned Maintenance System (PMS)	Maintenance of hoses and lifting gear - ensures equipment certified, inspected and replaced if necessary. Minimises risk of leaks occurring during operations.	Standard industry practice, environmental benefit outweighs costs of implementing procedure.	**Accept**
Lifting management procedures.	Minimise the risk of dropped objects.	Standard industry practice, environmental benefit outweighs costs of implementing procedure.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**

No hydraulic fluids or chemicals to be used during the activity	Reduces the potential risk of unplanned surface or subsea releases of hydrocarbons and chemicals to the marine environment.	It is not possible to eliminate the use of hydraulic fluids and chemicals for vessel operations. Control measures are in place to reduce risk of unplanned spills.	**Reject**
ALARP Assessment			
The transfer, storage and handling of hydrocarbons and chemicals offshore are commonly practised activities. There is a good understanding of potential spill sources, and the control measures required to manage these. The resulting impacts to marine fauna that could potentially result from a spill of this size would be Minor (II), with impacts restricted to a small number of individuals within a localised area. The assessed residual risk for this impact is '*Low*' (2) and classified as Type A decision. With no reasonable additional or alternative control measures identified that would offer a net environmental benefit, the impacts and risks are considered ALARP.			
Residual Risk Summary			
Consequence	**Likelihood**	**Residual risk**	
Minor (II)	Possible (C)	Low (2)	
Demonstration of Acceptability			
Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?		Yes – risks are reduced to ALARP, and the residual risk ranking is '*Low*' (2).	
Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?		Yes – the activity was evaluated as having the potential to result in minor consequence, and not result in serious or irreversible environmental damage.	
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?		Yes – aligns with SapuraOMV's HSE Policy and HSEMS.	
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?		Yes – management consistent with Marine Order 94 (Marine pollution prevention – packaged harmful substances), Marine Order 91 (Marine pollution prevention – oil) and with relevant species recovery plans and conservation management plans (**Table 4-3**) including but not limited to the:	

	• Blue Whale Conservation Management Plan 2015 – 2025 (DoE, 2015b); and • Conservation Advice (*Rhincodon typus*) whale shark (TSSC, 2015d).
Have stakeholder expectations been addressed?	N/A – no concerns raised.

Several conservation management and recovery plans (**Section 4.4.1.1**) identify oil or chemical spills as key threatening processes, through both direct and acute impacts, as well as indirect impacts through habitat degradation. The prevention of loss of containment events and reducing impacts to the marine environment through the preventative controls in place and spill response preparedness, demonstrates alignment with the various plans.

The proposed control measures are considered to be consistent with legislation, good oilfield practice/ professional judgement and environmental best practice. The activity has been evaluated in accordance with SapuraOMV's HSE Policy objectives and SapuraOMV is satisfied that when the proposed control measures are implemented that the residual risk of chemical and small hydrocarbon spills was assessed as `*Low'* (2). Stakeholders have been informed of the proposed activity, and no concerns have been raised (**Section 5)**. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of small hydrocarbon or chemical spills to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
No unplanned release of chemicals/ hydrocarbons to the marine environment.	Bulk liquid transfer points and equipment located on deck utilising hydraulic fluids (e.g. cranes, winches or other hydraulic equipment) will have primary bunding.	Vessel inspection records confirm that: • Bulk transfer points and equipment located on deck utilising hydraulic fluids have primary bunding or sheathing; and • All storage areas are bunded or secondarily contained.	Vessel Master
	Hydrocarbon and chemical storage areas are bunded or secondarily contained.		
	Vessel will implement procedures to ensure deck drainage systems	Vessel inspection records.	Vessel Master

are in place and maintained (e.g. scupper plugs), to reduce the potential for deck spills reaching the marine environment.		
Vessel will have current MARPOL-compliant SOPEP/SMPEP (as appropriate to vessel class) and tested in accordance with the training matrix.	Vessel inspection records confirm valid SOPEP/SMPEP.	Vessel Master
	Vessel inspection records confirm SOPEP/SMPEP tested as per schedule.	
Spill kits available at relevant locations (e.g. near potential spill points) and fully stocked on Vessel.	Vessel inspection records confirm spill kits available and maintained.	Vessel Master
	Incident reports record that spill(s) cleaned up using SOPEP/SMPEP resources.	
Engines/ machinery/ equipment (including in-water equipment) onboard vessels are certified and maintained in accordance with the Contractor's PMS.	Maintenance records confirm engines/ machinery/ equipment/ critical hoses are certified and maintained according to the PMS.	Chief Engineer
Regular inspection/ maintenance of critical hoses (including those for in-water equipment) according to the PMS.		
Storage, handling and use of hazardous substances (including hydraulic fluids and chemicals) are	Vessel inspection records confirm SDS for all chemicals used available onboard.	Vessel Master

	in accordance with the product’s Safety Data Sheet (SDS)	Induction records include requirement to follow SDS when storing, handling and clean-up of hazardous chemicals.	SapuraOMV Senior HSE Specialist
	Lifting management procedures for survey vessel.	Records (e.g. PTW, JSA) show all lifts conducted in accordance with lifting management procedures.	Vessel Master

8.3 Solid Releases (Loss Overboard)

Planned Activity
The following activities were identified as having the potential to result in solid releases overboard: • Vessel operations.
Hazard Identification
During the activity, non-hazardous solid materials and wastes stored onboard the vessel (e.g. paper, plastics and packaging), and hazardous solid wastes (e.g. batteries, fluorescent tubes, medical wastes, and aerosol cans) may be released unintentionally to the marine environment. This may occur due to inappropriate waste storage (e.g. overfull and/ or uncovered bins) resulting in materials being blown overboard or from being dropped accidentally overboard (e.g. as a result of lifting errors, lifting equipment failure, human error, or unsecure and unbalanced loads). Dropped objects or solid releases of significant weight could fall through the water column and settle on the seabed within the operational area. Buoyant material could potentially drift beyond the operational area and may result in injury or entanglement of marine fauna.
Environmental Impact Assessment
Dropped objects have the potential to impact: • Benthic habitats; • Marine fauna; and • Water quality. Accidental loss overboard of solid waste/ materials may impact the environment through localised reduction in water quality, disturbance to benthic habitats, or present a hazard to marine fauna, depending on the waste/ objects involved. Improper or ineffective management of solid wastes may result in pollution and contamination of the environment. Secondary impacts (ingestion and/ or entanglement) to marine fauna that may interact with buoyant waste material such as packaging and binding materials, may occur should these be lost overboard. Non-hazardous solid wastes such as plastics have the potential to smother benthic environments. Effects will be limited to localised physical disturbance to benthic communities within the operational area. The operational area does not overlap any KEFs and benthic habitats within the operational area are considered to generally comprise of unconsolidated soft sediments with relatively little seabed structure (**Section 4.5.5**). This habitat type is widely distributed and well represented in the NWS region. Any impact associated with this risk would be highly localised, proportional to the size of the solid waste, and would

be mitigated by the ubiquitous distribution of similar habitat in the region. Impacts to benthic communities from dropped object disturbance are expected to be short term in duration due to the ability for such communities to recover.

Release of hazardous solids (e.g. wastes such as batteries) would settle on the seabed if dropped overboard and may result in the pollution of the immediate receiving environment, leading to very localised detrimental impacts to marine flora and fauna.

Windblown waste is likely to be a rare event as wastes will be stored in closed/covered containers; but in the event of waste being blown overboard attempts would be made to recover it. There is the potential for windblown wastes to not be recovered from the marine environment, which may impact fauna via ingestion or entanglement. Marine turtles and seabirds are particularly at risk from entanglement, with marine turtles often mistaking floating debris for food. Given the Kanga-1 site survey operational area is located approximately 122 km away from the nearest turtle nesting beach (Legendre Island), and the nearest BIA boundary for marine turtles (flatback turtle) is ~46 km to the southeast of the operational area, the presence of turtles in the operational area is considered unlikely, and would only be transitory individuals. The operational area may be occasionally visited by migratory and oceanic birds but does not contain any emergent land and contains no known BIAs (including feeding), for any species.

Once ingested, debris such as plastics can damage internal tissues and inhibit physiological processes, both of which can potentially result in fatality. Floating non-biodegradable marine debris has been highlighted as a threat to blue whales and whale sharks in relevant Conservation Plans and Approved Conservation Advice (refer to **Table 4-3**). These as well as the *Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans* (DoEE, 2018) have specified a number of management actions to prevent and mitigate the impacts of harmful debris on vertebrate marine life. Of relevance to this activity is the legislation for the prevention of garbage disposal from vessels, which will be implemented through adherence to MARPOL and relevant Marine Orders.

Given the short-term nature of the activity (up to ~14 days), and the small volumes of solids expected to be generated, it is expected that any effects from inadvertent marine pollution would not have a detrimental effect on any fauna populations, including pygmy blue whales and whale sharks. At worst, in the unlikely event of release it may result in a limited local degradation of the environment; therefore, the overall consequence was assessed as Negligible (I) .

Standard Control Measures Considered

Control Measure	Environmental Benefit	Evaluation of Decision	Decision
Compliance with MARPOL 73/78 Annex V and Marine Order 95 (Marine pollution prevention – garbage)	Reduces the likelihood of accidental loss of waste overboard.	Sets out the requirements for garbage management plans and garbage record books. Benefits of ensuring vessel is compliant outweigh the minimal costs of	**Accept**

		personnel time and it is a legislated requirement.	
Segregation and securing waste.	Correct management of waste and reduction in the likelihood of accidental loss of waste overboard. All bins have lids which are to be secured	Reduces probability of garbage being discharged to sea, reducing potential impacts to marine fauna. Good industry practice. Environmental benefit outweighs costs.	**Accept**
Planned Maintenance System.	Maintenance of lifting gear - ensures lifting equipment certified and inspected. Minimises drop risk during lifting operations.	Standard industry practice, environmental benefit outweighs costs of implementing procedure.	**Accept**
Lifting management procedures.	Minimise the risk of dropped objects.	Standard industry practice, environmental benefit outweighs costs of implementing procedure.	**Accept**
Inductions include requirements for wastes management and training for crew in dropped object prevention.	Minimise drop risk by making personnel aware of the requirements for dropped objects prevention and waste management during the activity.	Good industry practice, environmental benefit outweighs costs of implementing procedure.	**Accept**
Attempt recovery of solid wastes overboard.	Reduces the consequence and/or duration of potential adverse effects.	Benefit outweighs cost if recovery is safe and practicable to do.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
None identified.			

ALARP Assessment		
Small amounts of solid non-biodegradable and hazardous wastes will be generated during the activity. The risk assessment and evaluation has identified a range of control measures that when implemented are considered to manage onboard storage of waste generated during the activity. Waste management measures on the survey vessel will minimise the risk of solid waste material being accidentally lost overboard. The use of lifting equipment offshore is well practiced and required as part of the activity. The risk assessment and evaluation has identified a range of control measures that minimise the risk of dropped objects. The commitment to recover dropped objects where practicable and safe to do so, ensures impacts and risks are reduced to ALARP. Control measures proposed ensure that the risk of dropped objects, lost equipment or release of solid waste to the environment has been minimised. Given the controls in place, the residual risk of releasing solids to the environment was assessed as '*Low*' (2) and classified as a Type A decision. With no reasonable additional or alternative control measures identified that would offer a net environmental benefit, the impacts and risks are considered ALARP.		
Residual Risk Summary		
Consequence	**Likelihood**	**Residual risk**
Negligible (I)	Possible (C)	Low (2)
Demonstration of Acceptability		
Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?		Yes – risks are reduced to ALARP, and the residual risk ranking is '*Low*' (2).
Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?		Yes – the activity was evaluated as having the potential to result in negligible consequence, and not result in serious or irreversible environmental damage.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?		Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?		Yes – management consistent with *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and relevant requirements under MARPOL Annex V and Marine Order 95 (Marine pollution prevention – garbage). Controls implemented will minimise the potential impacts from the activity to species identified in recovery plans and approved

	conservation advices as having the potential to be impacted by solid objects (**Table 4-3**). Specific actions that contribute to the long-term prevention of marine debris (*Objective 1* of the Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE, 2018)) have been adopted, including compliance with applicable legislation in relation to the improvement of waste management practices.
Have stakeholder expectations been addressed?	N/A – no concerns raised.

The proposed preventative and mitigation measures to prevent accidental release of hazardous and non-hazardous wastes are consistent with, and typical of industry best practice. Procedures for managing waste (i.e. handling, storage, transfer and disposal) meet legislative requirements under MARPOL Annex V and Marine Order 95.

The potential impact associated with this aspect is likely limited to a localised and short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity and is not considered as having the potential to result in serious or irreversible environmental damage.

The activity has been evaluated in accordance with SapuraOMV's HSE Policy objectives. Stakeholders have been informed of the proposed activity, and no concerns have been raised (**Section 5)**. With the adopted control measures, the residual risk associated with solid materials – loss overboard was assessed as '*Low*' (2). On this basis, it is considered that adherence to the environmental performance standards will manage the impacts and risks to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
No unplanned solid releases or dropped objects to the marine environment.	Compliance with MARPOL 73/78 Annex V, including: • Garbage Management Plan onboard;	Vessel inspection records confirm Garbage Management Plan onboard	Vessel Master
		Garbage Record Book	

	• Records of all waste to be disposed of or recycled; and • Placards to notify of disposal requirements.	Vessel inspection records confirm placards display disposal requirements.	
	Bins are available for the segregation of waste in accordance with the vessel Waste Management Plan, and bins are fitted with lids/cargo nets for waste with potential to be wind-blown	Vessel inspection records confirm bins available and suitably covered.	Vessel Master
	Crew inductions include waste management requirements.	Crew induction records include requirements for waste/garbage management.	SapuraOMV Senior HSE Specialist
	Lifting management procedures for vessel.	Records show all lifts conducted in accordance with lifting management procedures.	Vessel Master
	Lifting equipment is regularly inspected/maintained as per PMS.	PMS records.	Vessel Master
	Equipment and materials dropped to the marine environment are recovered where safe and practicable to do so.	Daily records show attempts to recover items lost overboard were undertaken where safe and practical to do so and corrective actions identified and undertaken.	Vessel Master

8.4 Marine Fauna Collision / Entanglement

Planned Activity
The following activities were identified as having the potential to result in marine fauna collision / entanglement: • Physical presence and movement of the survey vessel in the operational area; and • Towed geophysical survey equipment.
Hazard Identification
The survey vessel operating in and around the operational area may present a potential hazard to protected marine fauna, including cetaceans (e.g. pygmy blue whales), whale sharks and marine turtles. Collision (vessel strike) or entanglement with marine fauna has the potential to result in injury or mortality. Factors contributing to the frequency and severity of effects from collisions or entanglement vary greatly due to vessel type, equipment type, vessel operation (specific activity, speed), physical environment (e.g. water depth) and the type of animal potentially present and their behaviours.
Environmental Impact Assessment
The physical presence of vessels and towed geophysical equipment has the potential to result in: • Injury or death of marine fauna. Marine fauna in surface waters that would be most at risk from vessel strike or entanglement includes marine mammals, whale sharks and turtle species. As summarised in **Table 4-4**, the operational area overlaps with the pygmy blue whale distribution BIA and the whale shark foraging BIA. However, there are no turtle BIAs within the operational area. Research shows that vessel speed is a key factor in collisions with marine fauna, with faster vessels having a greater collision risk than slower vessels (Hazel et al. 2009; Laist et al. 2001; Lammers et al. 2003). For example, Laist et al. (2001) suggest that the most severe injuries would occur associated with vessel speeds greater than approximately 14 knots. Vessel speeds of 10 knots or less reduce the risk of vessel strike to low (Laist et al. 2014). The National Strategy for Reducing Vessel Strike on Cetaceans and ther Marine Megafauna 2017 (DoEE, 2017b) identifies that speed is a concern when considering collision risk, and that slower moving vessels provide greater opportunity for both fauna and vessel to avoid collision (DoEE, 2017b). **<u>Cetaceans</u>** Collisions between vessels and cetaceans occur more frequently where high vessel traffic and cetacean habitat overlap (Dolman and Williams-Grey, 2006). The reaction of whales to approaching ships is reported to be quite variable. While factors such as vessel speed are known to affect the incidence and severity of a collision, there is less knowledge on whale behaviour in the presence of vessels (McKenna et al. 2015). Laist et al. (2001) noted that individuals engaged

in behaviours such as feeding, mating or nursing may be more vulnerable to vessel collision, when distracted by these activities. A study by McKenna et al. (2015) showed that blue whales demonstrated limited behavioural response when being approached by ships; while some animals responded by undertaking shallow dives at a slow descent, none showed signs of horizontal movement away from the approaching ship.

Blue whales accounted for 2% of documented vessel strikes in Australian waters from 1997 to 2015 (Peel et al. 2016), and since 2006 there have been only two records of likely ship strikes of blue whales in Australia (DoE, 2015b). While the operational area overlaps the distribution BIA for pygmy blue whales, it is not a core habitat or aggregation area and therefore is not considered an 'area of concern' for vessel strikes (DoEE, 2017b). The Blue Whale Conservation Management Plan (DoE, 2015b) highlights that minimising vessel collision is one of the top four priorities and that the risk of vessel strikes on blue whales should be considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures implemented.

Marine Turtles

Turtles transiting the region are at risk from vessel strike when they periodically return to the surface to breathe and rest. However, only a small portion of their time is spent at the surface, as they typically spend more than 90% of their time underwater (Lutcavage and Lutz, 1997; Hochscheid et al. 2010). Turtles appear to be more vulnerable to boat strike in highly populated areas and in areas of marine development (DoEE, 2017a), and the effect of vessel speed can be significant on turtle flee response. A study by Hazel et al. (2007) recorded 60% of green turtles fleeing from vessels travelling at 4 km/h, while only 4% fled from vessels travelling at 19 km/h.

Studies (Ketos Ecology, 2009; Nelms et al. 2016) have shown that turtles are more susceptible to entanglement than other species of marine fauna, mainly due to their diving and resurfacing behaviour. However, the geophysical equipment that will be towed by the survey vessel will be at a distance markedly shorter than seismic streamers and tailbuoys (up to ~500 m behind the vessel), so the likelihood of entanglement is remote.

The closest turtle BIA is an internesting buffer for Flatback turtles (Dampier Archipelago), ~46 km to the south-southeast; therefore, the presence of turtles in the operational area is considered unlikely, and would only be transitory individuals.

Whale Sharks

Although the whale shark's skin is thicker and tougher than any other shark species, they are known to spend considerable time close to the surface, increasing their vulnerability to vessel strike. Whale sharks tagged off WA (Wilson et al. 2006; Gleiss et al. 2013) spent approximately 25% of their time less than two metres from the surface and greater than 40% of their time in the upper 15 m of the water columns. Whale sharks migrate large distances and can be found in coastal offshore waters. Spending such considerable time within the 15 m of the surface leaves them vulnerable to collision with smaller vessels (DoEE, 2017b). The Approved Conservation Advice (TSSC, 2015d) notes that the threat to the recovery of the species includes strikes from vessels. Establishing vessel speed restrictions and 'no approach zones' will reduce the threat of vessel collisions.

Summary

The National Strategy for Reducing Vessel Strike on Cetaceans and ther Marine Megafauna 2017 (DoEE, 2017b) does not make any recommendations with respect to maximum vessel speed, but case studies within the strategy have implemented a 10 knot speed limit in sensitive areas. Based on this information and to remain conservative, the survey vessel speed will be limited to 6 knots within the operational area.

It is unlikely that survey vessel movements in the operational area will result in any collisions or entanglement given (1) the short duration of the activity (up to ~14 days), (2) the low density of transiting individuals, (3) avoidance behaviour commonly displayed, (4) the area affected represents only a very small portion of the available area for marine fauna, and (5) low operating speed of the survey vessel (including being stationary during all geotechnical sampling). Should a collision occur, low vessel operating speeds would reduce the likelihood of serious injury. Therefore, any impacts are expected to be localised and of Minor (II) consequence.

Standard Control Measures Considered

Control Measure	Environmental Benefit	Evaluation of Decision	Decision
Vessels will comply with EPBC Regulations 2000 – Part 8 Division 8.1	Reduces risk of collision or entanglement impacts to cetaceans from vessels because if cetaceans are sighted, then vessels will slow down or move away.	Operational costs to adhere to marine fauna interaction restrictions, such as vessel speed and direction, are based on legislated requirements and must be accepted.	**Accept**
Vessels will comply with Whale Shark Interaction Guidelines	Reduces risk of collision or entanglement impacts to whale sharks from vessels because if whale sharks are sighted, then vessels will slow down or move away.	Benefits in reducing impacts to whale sharks outweigh the minor costs incurred by SapuraOMV.	**Accept**
Vessel strikes with cetaceans reported in the National Ship Strike Database at: https://data.marinemammals.gov.au/report/shipstrike	Understanding when, where, how and why vessels collide with cetaceans is important in developing appropriate mitigation to reduce the occurrence of these events.	Negligible cost, control is considered standard and good industry practice.	**Accept**

Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Dedicated MFO onboard for duration of the activity, if occurring during peak activity times for pygmy blue whales and/or whale sharks in relation to the operational area: • May-June and Nov-Dec for pygmy blue whales; and • Sept-Nov for whale sharks.	A dedicated MFO onboard during peak activity times would improve the ability to spot and identify marine fauna at risk of harm from vessel strike.	Some operational costs associated but benefits in reducing impacts to marine fauna outweigh the costs.	**Accept**
Adjust the activity schedule to occur entirely outside of sensitive periods (e.g. peak whale shark migration period).	Adjusting the activity schedule to avoid peak periods for marine fauna presence in the operational area may reduce potential for collisions/entanglement with marine megafauna.	Variation of timing of specific activities is not feasible as activity is subject to schedule constraints and vessel availability. Significant cost and schedule impacts if timeframes restricted. The cost is considered grossly disproportionate to environmental benefit, given that the risk of vessel strike is already low.	**Reject**
Restrict the activity to daylight hours only.	Restrict the activity to only allow daylight operations reduces the potential risk of vessel strike with marine fauna during periods of reduced visibility/ night-time.	Restricting the timing of the activity to only during daylight hours would substantially lengthen the schedule resulting in increased risks and impacts from planned discharges (air and noise emissions, etc.), interaction with other marine users, etc. Costs associated with this control and subsequent extended schedule	**Reject**

		are considered grossly disproportionate to the overall environmental benefit, given that the risk of vessel strike is already low.	
Vessel speed restrictions – 6 knots within the operational area.	Slower moving vessels provide greater opportunity for both fauna and vessel to avoid collision and reduce severity of impact in the event of collision.	Negligible costs associated with this control measure. Benefit outweighs the cost	**Accept**

ALARP Assessment

There are no alternatives to the use of vessels to undertake the activity. Furthermore, vessel operations are not considered unusual in this area and the risks of fauna interaction are well understood. The inherent likelihood of encountering fauna in the operational area is limited by the short duration of the activity and the separation from areas of high fauna density.

The impact and risk assessment and evaluation has identified a range of control measures that when implemented are considered to manage the risk and impact of collision/entanglement with marine fauna. Further opportunities to reduce impacts have been investigated with one additional control accepted: vessel speed restrictions of 6 knots while conducting the activity within the operational area, which will ensure risk and impacts of vessel collision and close-range encounters with marine fauna is minimised. This is consistent with *Objective 3* of the National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna (DoEE, 2017b).

With the proposed control measures in place, the residual risk of marine fauna collision/entanglement was assessed as '*Low*' (2), classified as a Type A decision, and no further reasonably practicable measures to reduce the risk were identified. With the accepted additional control measure of reducing vessel speed, the impacts and risks are considered ALARP.

Residual Risk Summary

Consequence	Likelihood	Residual risk
Minor (II)	Unlikely (D)	Low (2)

Demonstration of Acceptability

Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to '*Medium*' (3)?	Yes – risks are reduced to ALARP, and the residual risk ranking is '*Low*' (2).
Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?	Yes – the activity was evaluated as having the potential to result in minor consequence, and not result in serious or irreversible environmental damage.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?	Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?	Yes – management consistent with EPBC Regulations 2000 – Part 8 Division 8.1, Whale Shark Interaction Guidelines and the National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna (DoEE, 2017b). Controls implemented will minimise the potential impacts to species identified in recovery plans and conservation advices (**Table 4-3**). Relevant species recovery plans, conservation management plans and management actions, include but are not limited to the: • Blue Whale Conservation Management Plan 2015 – 2025 (DoE, 2015b); and • Conservation Advice (*Rhincodon typus*) whale shark (TSSC, 2015d).
Have stakeholder expectations been addressed?	N/A – no concerns raised.

Vessel movements are an accepted part of recreational and commercial activities in the region, and fauna collision/entanglement is an inherent and well understood risk. Vessel movements will comply with all relevant maritime standards and regulations, including EPBC regulations and interaction guidelines, to minimise risks to marine fauna. The impact assessment has determined that given the adopted controls, vessel collision/entanglement with marine fauna represents a low risk rating that is unlikely to result in a potential impact greater than minor.

The activity has been evaluated in accordance with SapuraOMV's HSE Policy objectives. Stakeholders have been informed, and no concerns have been raised (**Section 5)**. With the adopted control measures, the potential impacts and risks of vessel collision/entanglement with marine fauna will be managed consistent with relevant Recovery Plans and Approved Conservation Advice, and the residual risk was assessed as '*Low*' (2). Therefore, SapuraOMV considers that adherence to the environmental performance standards will manage the impacts and risks to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
No injury and/ or fatality to marine megafauna caused by vessel collision/entanglement.	Compliance with EPBC Regulations 2000– Part 8 Division 8.1 Interacting with Cetaceans. • Within Caution Zone, vessels will not drift or approach closer than 100 m for a whale, 50 m for a dolphin known to be in the area; and • Vessels will not change course or speed suddenly, and must move at a constant slow speed away from a whale if it approaches the vessel or comes within 150 m, 50 m for a dolphin.	Daily operations reports note when cetaceans were sighted in the caution zone and interaction management actions implemented.	Vessel Master
	Vessels adopt measures consistent with the DPaW Whale Shark Management Program (2013), including: • Taking action to avoid approaching or drifting closer than 30 m of a whale shark.	Daily operations reports note when whale sharks were sighted in the caution zone and interaction management actions implemented.	Vessel Master
	Survey vessel will travel no faster than 6 knots within the operational area.	Bridge logbook.	Vessel Master

	Environmental awareness induction provided to vessel crew, that includes marine fauna interaction requirements.	Induction presentation.	SapuraOMV Senior HSE Specialist
		Induction attendance records.	SapuraOMV Lead Engineer
	All collisions with cetaceans will be reported to DAWE and the National Ship Strike Database.	Communication records confirming ship strikes have been reported to DAWE and the National Ship Strike Database.	Vessel Master SapuraOMV Lead Engineer

8.5 Introduction of Invasive Marine Species

Planned Activity
The following activities were identified as having the potential to result in introduction of invasive marine species: • Vessel operations.
Hazard Identification
Invasive marine species (IMS) are marine plants, animals and algae that have been introduced into a region that is beyond their natural range but that have the ability to survive and possibly thrive (DAWE, 2019). Some IMS pose a significant risk to environmental values, biodiversity, ecosystem health, human health, fisheries, aquaculture, shipping, ports and tourism (DAWE, 2019; Wells et al. 2009). IMS can cause a variety of adverse effects in a receiving environment, including: • Over predation of native flora and fauna; • Displacement or outcompeting native marine species; and • Depletion of viable fishing areas and aquaculture stock. Australian waters are subject to the risk of invasion by marine pests from two sources: introduction of species directly from overseas, and translocation from established populations elsewhere in Australia. If managed ineffectively, these pathways pose an unacceptable biosecurity risk to Australia's environment, economy/ social/ cultural values from the entry, and establishment and spread of marine pests and associated diseases. Preventing the introduction and spread of marine pests is therefore vital to ensure that the potentially significant consequences on Australia's marine industries and environment are minimised.
Environmental Impact Assessment
Introduction of IMS during the activity has the potential to impact: • Ecosystem dynamics; and • Commercial and recreational fishing. All vessels are subject to some level of marine biofouling. Biofouling of vessels, marine equipment, and structures is recognised as an important vector for introduced pests. Vessels pose a high risk for the spread of IMS, by accumulating on the vessel hull, particularly in areas where organisms can find a good attachment surface (e.g. seams, strainers and unpainted surfaces), where turbulence is lowest (e.g. niches, sea chests etc.) and in internal seawater systems. Submersible structures and equipment can also accumulate IMS, particularly after long periods stationary or at low speeds (DAWE, 2019). Commercial

vessels typically maintain anti-fouling coatings to reduce the build-up of fouling organisms; but organisms can also be drawn into ballast tanks during onboarding of ballast water required to maintain safe operating conditions. The vessels for this survey will be sourced from within Australia, avoiding any potential to translocate exotic species from overseas. However, depending on the vessel's preceding operating history, there is the potential for the survey vessel to transfer IMS from other Australian waters into the operational area. The survey vessel also has the potential to introduce IMS through biofouling (containing IMS) on submersible structures. Potential IMS vary from one region to another depending on various environmental factors such as water temperature, salinity, nutrient levels and habitat type, which dictate their survival and invasive capabilities. Therefore, not all species that are introduced to an area outside of their natural range survive to become an IMS, with the majority of introduced species failing to establish (Williamson and Fitter, 1996). IMS typically require hard substrate in the photic zone, therefore requiring shallow waters to become established. Highly-disturbed, shallow-water environments such as shallow coastal waters, ports and marinas are more susceptible to IMS colonisation, whereas IMS are generally unable to successfully establish in deep water ecosystems (Geiling, 2014) and open-water environments where the rate of dilution and the degree of dispersal are high (Paulay et al. 2002). Only a few species are known to extend into deeper waters of the continental shelf (Bax et al. 2003). Unlike many other types of environmental impacts, invasions of introduced marine species can be irreversible, making their prevention or early detection the most important aspects of marine pest management. Theory and experimental trials indicate that removing biological material, via ballast water exchange, ballast water treatment or increasingly stringent hull and niche area cleaning, will reduce inoculation pressure and therefore invasion risk (Bailey, 2015; Molina and Drake, 2016). The unconsolidated soft sediment, deep water (~147 m) and offshore location of the operational area is unlikely to represent suitable habitat for the establishment of IMS. If an IMS was introduced, and if it did colonise the operational area, it is expected that any colony would remain fragmented and isolated and would not be able to propagate to nearshore environments, and protected marine areas present in the wider region. Following establishment, eradication of IMS populations is difficult, limiting management options to ongoing control or impact minimisation. Therefore, there is the potential for a localised, but irreversible, impact to habitat resulting in a Moderate (III) consequence severity. Compliance with regulatory requirements for the management of ballast water and ensuring all vessels are assessed as posing a low biofouling risk, in accordance with national guidelines, will significantly reduce the likelihood of translocation of an IMS. Successful colonisation in the area would be difficult given the nature of the benthic habitats within the operational area, and location outside of coastal waters where the risk of IMS establishment is considered greatest (Paulay et al. 2002). It is therefore considered Remote (E) that the activity would result in the introduction and establishment of an IMS and any subsequent ecological impact.

Standard Control Measures Considered

Control Measure	Environmental Benefit	Evaluation of Decision	Decision

Adherence to Marine Order 98: (Marine pollution – antifouling systems) 2013 – anti-fouling system.	Reduces the potential risk of IMS translocated through biofouling.	Operational costs for inspection and certification of anti-fouling systems. Legislated requirement and must be accepted.	**Accept**
Vessel will comply with the following key requirements of the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia, 2009) of which key requirements are: • Maintenance of a biofouling electronic records outlining marine fouling management actions; • Completion of an IMS risk assessment prior to mobilisation which concludes a low risk of IMS presence; and • In-water equipment free of marine fouling prior to the commencement of the activity.	Reduces the risk of introducing IMS through implementation of vessel assessments and requirement for immersible equipment to be cleaned.	Costs involved in demonstrating vessel is of 'low risk' of introducing IMS through completion of risk assessment as well as the requirement for equipment to be cleaned could lead to potential delays in activity schedule should additional cleaning and inspections be required. Good industry practice. Minimal costs to activity are considered outweighed by the benefits of reducing the risk of IMS.	**Accept**
Survey vessel will manage their ballast water as specified in the Australian Ballast Water Management Requirements Version 8 (DAWE, 2020f).	Reduces the likelihood of transferring IMS to the operational area.	Minimal cost and controls based on legislative requirements under the *Biosecurity Act 2015*.	**Accept**
Survey vessel will have (where applicable): • An approved ballast water management plan; • A valid ballast water management certificate; and • A ballast water record system.	Reduces the risk of introducing IMS through procedures managing ballast water exchange.	Minimal cost and controls based on legislative requirements under the Ballast Water Management Convention and Resolution MEPC.127 (53).	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			

Control Measure	Environmental Benefit	Evaluation of Decision	Decision
No ballasting water during the activity.	Reduces the potential risk of IMS translocated through ballast waters.	Ballast water exchange/discharge may be necessary to ensure safety of the vessel. With appropriate management in accordance with Australian Ballast Water Management Requirements, the risk of IMS establishment is low.	**Reject**
Only use vessels operating in Australian waters and have not been mobilised from international waters.	Reduces the likelihood of introducing IMS and the potential risk of IMS translocated from high-risk international waters.	Specialised vessels capable of completing geophysical and geotechnical survey requirements are available Australia-wide. Minimal costs associated with finding an Australian vessel are considered outweighed by the benefits of reducing the risk of IMS.	**Accept**

ALARP Assessment

There are no alternatives to the use of a vessel and submersible equipment in order to undertake the activity. The introduction pathways for IMS via ballast water and biofouling are well understood in the marine industry and managed by both national and international regulations and industry guidance. Legislation and guidance is in place to manage this specific risk, which the survey vessel is required to comply with.

Further opportunities to reduce impacts have been investigated with one additional control accepted: sourcing an Australian-based vessel, to reduce the likelihood of translocating an IMS. With the proposed controls, the residual risk was assessed as '*Low*' (2) and classified as a Type A decision. SapuraOMV considers the adopted control measures appropriate to manage the risk of introduction of IMS to the marine environment; therefore, the impacts and risks are considered to be ALARP.

Residual Risk Summary

Consequence	Likelihood	Residual risk
Moderate (III)	Remote (E)	Low (2)

Demonstration of Acceptability	
Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking between '*Very Low*' (1) to'*Medium*' (3)?	Yes – risks are reduced to ALARP, and the residual risk ranking is '*Low*' (2).
Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?	Yes – measures have been adopted even though there is little scientific uncertainty associated with this aspect. The activities are well known, the pathways for introducing IMS are well understood, well regulated, and managed. Conservation of biological diversity and ecological integrity has been a fundamental consideration in the assessment and adoption of controls.One additional control will be implemented to further reduce the risk of impact. Therefore, the activity does not compromise the relevant principles of ESD.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?	Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?	Yes – the following legislative and other requirements are considered relevant: • *Biosecurity Act 2015*; • International Convention for the Control and Management of Ships' Ballast Water and Sediments (IMO, 2004); • National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (MPSC, 2018); • Marine Order 98 (Marine pollution prevention – anti-fouling systems) 2013; • Australian Ballast Water Management Requirements Version 8 (DAWE, 2020f); and

	• Aquatic Resources Management Act 2016.
Have stakeholder expectations been addressed?	N/A – no concerns raised.

The location of the operational area is in a highly dispersive, open ocean environment with no adjacent shallow water environments, indicating a low likelihood of pests establishing and flourishing or translocating to another environment. Given the impacts to habitat from the introduction of an IMS would be limited to soft sediment communities (that are not associated with any particular value and sensitivity), and given the widespread homogenous nature of these habitats in the region, this event would not be considered as having the potential to affect biological diversity and ecological integrity.

IMS is identified as a key threat in several conservation management plans, with actions focusing on the prevention of their introduction. The proposed control measures are consistent with these actions.

The operational area is not located within any AMPs. However, the management of the introduction of IMS is in accordance with the requirements of MARPOL, which meets the management prescriptions for AMPs under the North-West Marine Parks Network Management Plan.

Stakeholders have been informed of the proposed activity, and no concerns have been raised regarding IMS risks (**Section 5)**. Through the use of an Australian based vessel and compliance with all legislative obligations and industry practices regarding ballast water and anti-fouling management, the residual risk of introduction of IMS was assessed as '*Low*' (2). Based on the criteria above, SapuraOMV considers the adopted control measures appropriate to manage the risk of introducing IMS to be of an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
No introduction of IMS.	All vessels (of appropriate class) maintain a current anti-fouling coating that complies with the requirements of Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships (2001), the requirements of the *Protection of the Sea (Harmful Antifouling Systems) Act 2006*, and Marine	Audit verifies support vessels (of appropriate class) have a current International Anti-fouling Systems certificate or a Declaration on Anti-fouling Systems.	Vessel Master

	Order 98 (Marine pollution – antifouling systems) 2013.		
	Biofouling managed in accordance with requirements of the National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (MPSC, 2018) including: • Biofouling Record book outlining antifouling management actions; • Biofouling risk assessment shows low risk of IMS presence (i.e. DPIRD vessel check tool); and • Routine immersible equipment (e.g. ROV) cleaning and maintenance are sufficient to maintain low risk.	Biofouling Record Book	Vessel Master
		Completed DPIRD vessel check report demonstrating vessel is low risk.	SapuraOMV Lead Engineer
	Contracted survey vessel will have been previously operating in Australian waters.	Vessel log book	SapuraOMV Lead Engineer
	Survey vessel will have: • A valid Ballast Water Management Plan (BWMP); and • A valid Ballast Water Management Certificate (BWMC).	Audit verifies valid BWMP on vessel.	Vessel Master
		Audit verifies valid BWMC on vessel.	Vessel Master

	Survey vessel will maintain and complete records of all ballast water management in compliance with Regulation B-2 of the Annex to the Ballast Water Convention.	Ballast Water Record System (electronic or hard copy).	Vessel Master
	Survey vessel will manage ballast water exchange following approved methods of the Australian Ballast Water Management Requirements (DAWE, 2020f): • An approved ballast water management system (BWMS); or • Use of low risk ballast water, defined as: – Fresh potable water; – Water taken up on the high seas (> 12 nm from any land mass and > 50 m deep); and – Water taken up and discharged in the same place. • Retention of high-risk ballast water; or • Discharge in an approved ballast water reception facility.	Audit verifies valid BWMS Type Approval Certificate available onboard. Ballast Water Record System (electronic or hard copy).	Vessel Master

8.6 Spill Response Operations

Planned Activity
In the event of a hydrocarbon spill, response strategies will be implemented where possible to reduce environmental impacts to ALARP. The selection of strategies will be undertaken through the Net Environmental Benefit Analysis (NEBA) process, outlined in Appendix A of the OPEP. The response strategies and supporting activities deemed appropriate for the worst-case oil spill scenario identified for the activity are detailed in Table 1.1 of the OPEP, and comprise: • Source control; • Operational monitoring; • Oiled Wildlife response (OWR); and • Scientific monitoring.
Hazard Identification
Spill response operations will be within offshore waters using vessels, aircraft, and personnel. Depending on the oil spill response strategies implemented following the operational NEBA, potential impacts may result from one or more of the following: • Interference with marine other users; • Seabed disturbance; • Light emissions; • Noise emissions; • Atmospheric emissions; • Operational discharges; • Waste management; • Introduction of invasive species; • Marine fauna interaction; and • Marine spills. No shoreline contact is predicted from an MDO spill.
Environmental Impact Assessment

Interference with other marine users
Spill response activities, including the use of vessels, in the nearshore and offshore marine environment may disrupt other uses of the areas involved. As well as potential direct disturbance to commercial or recreational fishing or marine-based tourism, this has the potential to affect tourism or the local community through demands on local accommodation and businesses and reducing the availability of services. The extent of disturbance relative to the operating areas of other users is likely to be small and temporary. With control measures implemented, the consequence of disturbance to other users is considered to be Minor (II).
Seabed disturbance
Seabed disturbance from vessels include damage through the deployment of anchors/chains and collection of sediment samples for scientific monitoring. With control measures implemented, the consequence of seabed disturbance is considered to be Negligible (I).
Light emissions
Spill response activities which require lighting may take place in areas important to turtles and birds (BIAs). Lighting may cause behavioural changes to fish, birds and marine turtles which can have a heightened consequence during key life-cycle activities, for example turtle nesting and hatchling emergence. The most sensitive receptors to lighting from vessel operations are seabirds/shorebirds and marine turtles, including threatened and migratory species. Sea-based response activities will be restricted to daylight hours and spill response vessels will demobilise after sunset to mooring areas offshore where they will display only navigation/safety lighting. With control measures implemented, the consequence of light emissions is considered to be Negligible (I).
Noise emissions
Noise emissions generated by vessels and aircraft associated with offshore response activities have the potential to disturb marine fauna, notably marine mammals, through underwater sound. Given the activities will be relatively short-term at any location and the response strategies do not involve especially intensive noise sources, with control measures implemented the consequence of noise emissions will be Negligible(I).
Atmospheric emissions
The internal combustion engines on vessels and/ or mobile equipment (e.g. generators) used to support response activities will generate atmospheric emissions that have the potential to reduce local air quality and contribute to GHG levels. Given the remote locations where most response activities are likely to be conducted and the localised effects from atmospheric emissions, the consequence of atmospheric emissions will be Negligible (I).
Routine discharges
Sewage, grey water and other operational discharges from vessels used in response activities will create a localised and temporary reduction in marine water quality. However, standard maritime regulatory requirements for vessel discharges, including prohibition of discharge close to shorelines, treatment prior to discharge etc., are considered to reduce any consequences to Negligible (I).

Waste management
Waste generated during response activities, particularly oily wastes associated with clean-up activities, has the potential to cause adverse effects to habitats and biota if not appropriately managed. However, in the event of a MDO spill from a fuel tank rupture in the operational area, neither containment and recovery or clean-up activities have been identified as feasible response options as spill modelling predicts no shoreline loading with risks/impacts limited to the upper waters of the open ocean environment. There is also the potential for contamination to be spread if vessels and/or equipment are not appropriately cleaned to remove oily wastes when moving from spill impacted areas. All vessel-generated oily wastes will be collected, contained and appropriately disposed of in line with regulations (**Section 8.2**) to ensure potential physical (oiling) or toxic effects are avoided. Decontamination procedures and/or sites will be used during the spill response to ensure wastes from OWR response are collected/contained and the potential for secondary contamination of non-impacted areas is avoided. With control measures implemented the consequence level of waste management will be Negligible (I).
Invasive marine species
The mobilisation of vessels, personnel and equipment into offshore waters has the potential for introducing of non-indigenous and potentially invasive species, either as biofouling or in the ballast of vessels. However, the ability for a non-native species to establish is generally mitigated in deeper offshore waters where the depth, temperature, light availability and habitat diversity is not generally conducive to supporting reproduction and persistence of the invasive species. All response vessels will be subject to IMS risk assessments (**Section 8.5**) and quarantine and biosecurity requirements, including inductions, pre-cleaning and inspections, will be applied to reduce the risks from onshore operations. The operational NEBA will specifically consider the potential risks from exotic species in the event that activities are required in areas where consequences would be elevated, such as at isolated offshore islands. While the consequences are potentially Moderate (III) if an invasive species was introduced and became established, the control measures proposed are considered to reduce the likelihood of such an incident occurring to Remote (E).
Marine fauna interaction
Oil spill response has the potential for interactions with marine fauna through: • Vessel movements associated with most response strategies; • Booms that may be used for source control around the rupture, and that may create a physical barrier on the surface waters that has the potential to injure or entangle passing marine fauna that are either surface breathing or feeding; or • Unavoidably during OWR. OWR may include the hazing, capture, handling, transportation, cleaning and release of wildlife susceptible to oiling such as birds and marine turtles. While OWR is aimed at reducing spill impacts to fauna, if not planned and implemented appropriately it can potentially create additional stress through incorrect cleaning and handling of oiled wildlife and exacerbate impacts by driving more wildlife into oiled areas or interfering with key life-cycle processes (e.g. nesting,

internesting). Vessel use during response also increases the chance of contact or physical disturbance with marine megafauna such as whales and turtles. With control measures implemented, the consequence of interactions with marine fauna from vessels is considered to be Minor (II).			
Marine spills			
Potential risks and impacts, and management of vessel deck spills are described previously (**Section 8.2**). Though the likelihood of intensive vessel-based operations as part of oil spill response is remote, if invoked there may be a need for onsite refuelling, which introduces the risk of minor spills to sea. All refuelling operations would be undertaken in accordance with refuelling procedures to minimise the likelihood of spills and a small fuel spill in the context of a major spill response incident would have Negligible (I) consequences.			
Standard Control Measures Considered			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Spill response activities selected on basis of a NEBA.	Provides a systematic and repeatable process for evaluating strategies with net least environmental impact	Considered a standard spill response control.	**Accept**
Vessels will be fitted with lights, signals, AIS transponders and navigation and communications equipment, as required by the *Navigation Act 2012*.	Vessel navigational aids and communication equipment will enable other marine users aware of their presence and position, to reduce the possibility of interaction.	Considered a standard spill response control (regulatory requirement).	**Accept**
Vessels and aircraft will comply with EPBC Regulations 2000 – Part 8 Division 8.1.	Reduces risk of physical and behavioural impacts to cetaceans.	Considered a standard spill response control (regulatory requirement).	**Accept**
Vessels will comply with Whale Shark Interaction Guidelines.	Reduces risk of physical and behavioural impacts to whale sharks.	Considered good industry practice.	**Accept**

Vessels meet applicable MARPOL garbage and putrescible waste disposal requirements.	Reduces potential for water quality impacts.	Considered a standard spill response control (regulatory requirement).	**Accept**
Vessels meet applicable MARPOL sewage disposal requirements as appropriate for vessel class.	Reduces potential for water quality impacts.	Considered a standard spill response control (regulatory requirement).	**Accept**
Vessels meet applicable MARPOL requirements for oily water (bilge) discharges as appropriate for vessel class.	Reduces potential for water quality impacts.	Considered a standard spill response control (regulatory requirement).	**Accept**
Vessels meet Australian Ballast Water Management Requirements.	Reduces risk of IMS.	Considered a standard spill response control (regulatory requirement).	**Accept**
Stakeholder consultation.	Early awareness of spill response activities which reduces potential disruption and ensure that relevant government agencies support the response strategies thus minimising potential impacts and risks to sensitivities.	Considered a standard spill response control.	**Accept**
Additional Control Measures Considered (ALARP Evaluation)			
Control Measure	**Environmental Benefit**	**Evaluation of Decision**	**Decision**
Restrict external lighting to lower intensity and longer wavelength light source.	Long wavelength and low intensity lights reduce potential for impacts on certain sensitive receptors from light emissions.	Vessels will not be conducting response activities at night. Restricted intensity and wavelength lighting on vessels are not standard equipment on vessels operating on the NWS.	**Reject**

		Hence, there will be additional costs of maintaining suitably equipped (lighting) vessels on standby or delays to allow vessel lights to be refit. This is considered grossly disproportionate to environmental benefit considering the low risk and impact with proposed control measures in place.	
No onsite refuelling of vessels.	Avoiding refuelling of vessels onsite would eliminate the potential for minor onsite spills during refuelling of vessels.	Depending on the location and type of operations, it may be impractical for small vessels, as it would require return to port to refuel. This could interrupt, delay and/ or reduce the efficiency of response activities, thereby increasing overall spill risk. The cost is considered grossly disproportionate to environmental benefit considering the low risk and impact with proposed control measures in place.	**Reject**
ALARP Assessment			
The risk of a hydrocarbon release to the marine environment requiring response has been reduced to ALARP (**Section 8.1**). A NEBA is the primary tool used during spill response to evaluate appropriate response options with the goal of selecting strategies that result in the least net impact to key environmental sensitivities. In the highly unlikely event of a Level 2 spill, the NEBA process will be applied to ensure that the implementation of response activities will reduce overall impacts to the environment from the spill and associated response.			

A preliminary NEBA has been conducted on the basis of the predicted worst-case hydrocarbon spill extent and knowledge of existing sensitive receptors in the MEZ and EMBA. The most appropriate spill response strategies have been identified based on this assessment. All of the identified response strategies are recognised oil spill response techniques in Australia where a net environmental benefit is indicated. The selection of spill response strategies and the implementation of spill response plans in the event of a spill will be performed in collaboration with specialist spill responders and statutory authorities, and through application of an operational NEBA, as outlined in the OPEP. The operational NEBA will be based on real-time information to ensure that impacts and risks are continually reduced to ALARP during a spill response. There are no reasonably practicable additional or alternative control measures to further reduce potential impacts and risks of emergency response activities on the environment. Given that implementation of response activities cannot be avoided if the potential impacts from a spill are going to be minimised, all reasonably practicable controls to reduce impacts of response activities have been identified. With the management proposed to reduce the likelihood of an emergency spill scenario, the application of NEBA and the controls identified above, the assessed residual risk for this impact is '*Low*' (2) and classified as Type A decision. With no reasonable additional or alternative control measures identified that would offer a net environmental benefit, the impacts and risks are considered ALARP.		
Residual Risk Summary		
Consequence	**Likelihood**	**Residual risk**
Moderate (III)	Remote (E)	Low (2)
Demonstration of Acceptability		
Are the environmental impacts and risks reduced to ALARP, and the residual risk ranking determined to be '*Very Low*' (1) to '*Medium*' (3)?		Yes – risks are reduced to ALARP, and the residual risk ranking is 'Low' (2).
Is the activity carried out in a manner consistent with the principles of ecologically sustainable development (ESD)?		Yes – the activity was evaluated as having the potential to result in minor consequence, and not result in serious or irreversible environmental damage.
Are the potential risks and hazards consistent with SapuraOMV's policy and standards?		Yes – aligns with SapuraOMV's HSE Policy and HSEMS.
Have legislative and other requirements been met? Industry codes, standards and guidelines applied?		Yes – response has been developed in accordance with: • OPGGSA; • AMSA Technical Guideline for the Preparation of marine Pollution Contingency Plans for Marine and Coastal Facilities (AMSA, 2015); and

	• NOPSEMA Guidance Note - Oil Pollution Risk Management (NOPSEMA, 2018).
Have stakeholder expectations been addressed?	N/A – no concerns raised.

All practicable means to prevent a vessel collision will be in place prior to and during the survey. Every effort has been made to identify and select suitable spill response options. The spill response options selected are based on hydrocarbon characteristics, and the known sensitivities and values that could be impacted (including AMPs), and are consistent with relevant standards and guidelines, including NATPLAN. The selection of spill response strategies and the implementation of spill response plans will be performed through an industry standard process and in collaboration with spill response providers and statutory authorities, as outlined in the OPEP.

The proposed control measures are considered to be consistent with legislation, good oilfield practice, professional judgement and environmental best practice. The residual risk was assessed as '*Low*' (2), and stakeholders have been informed of the proposed activity, and no concerns have been raised (**Section 5)**. The activity has been evaluated in accordance with SapuraOMV's HSE Policy objectives and SapuraOMV is satisfied that with the proposed control measures implemented, the impacts and risks of spill response activities have been reduced to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria	Responsibility
Oil spill response undertaken in a manner that will result in net benefit to marine fauna and the environment.	Operational NEBA undertaken to inform ongoing response strategies.	Records confirm operational NEBA undertaken as part of Incident Action Plan.	Incident Commander
	Operational monitoring and evaluation will be implemented in accordance with Section 3.4 of the OPEP to inform oil spill response, including: • Oil spill trajectory modelling; • Tracking buoy(s); • Aerial surveillance; • Vessel surveillance; and	Records confirm operational monitoring and evaluation implemented as per OPEP, including: • Trajectory modelling, aircraft, vessel, AMOSC and satellite imagery contracts; and • Tracking buoy locations.	Incident Commander SapuraOMV Senior HSE Specialist

• Satellite imagery.		
Scientific monitoring will be implemented in accordance with the Operational Scientific Monitoring Plan (OSMP) in accordance with OPEP Sections 3.4 and 3.5 to inform oil spill response.	Records confirm scientific monitoring has been implemented in accordance with OSMP.	SapuraOMV Senior HSE Specialist
OWR will be managed by relevant regulatory authorities and trained personnel in accordance with the WA OWR Plan (WAOWRP) in accorandance with OPEP Section 3.6 (including establishment of an OWR Centre as per OPEP Section 5.2).	Incident Management Team (IMT) log.	Incident Commander SapuraOMV Senior HSE Specialist
Compliance with EPBC Regulations 2000– Part 8 Division 8.1 Interacting with Cetaceans. • Within caution zone (300 m either side of the animal), vessels will not drift or approach closer than 100 m for a whale, 50 m for a dolphin known to be in the area; and • Vessels will not change course or speed suddenly, and must move at a constant slow speed away from a whale if it	Daily operations reports note when cetaceans were sighted in the caution zone and interaction management actions implemented.	Vessel Masters Helicopter Pilots

	approaches the vessel or comes within 150 m, 50 m for a dolphin. • Helicopters will not fly lower than 1650 ft when within 500 m horizontal distance of a cetacean except when landing or taking off and will not approach a cetacean from head on.		
	Vessels adopt measures consistent with the DPaW Whale Shark Management Program (2013), including: • Taking action to avoid approaching or drifting closer than 30 m of a whale shark.	Daily operations reports note when whale sharks were sighted in the caution zone and interaction management actions implemented.	Vessel Masters
	All vessels involved in oil spill response activities will manage sewage in accordance with MARPOL Annex IV and AMSA Marine Order 96 (as appropriate to vessel class).	Vessel logs demonstrate that all sewage discharges are compliant with MARPOL Annex IV and AMSA Marine Order 96.	Chief Engineers
	All vessels involved in oil spill response activities will manage garbage and putrescible wastes in accordance with MARPOL Annex V and AMSA Marine Order 95.	Garbage Record Book.	Vessel Masters

	All vessels involved in oil spill response activities will manage deck drainage and bilge in accordance with MARPOL Annex I and AMSA Marine Order 91 (as appropriate to vessel class).	Oil Record Book.	Chief Engineers
	All vessels involved in oil spill response activities will manage ballast water exchange following approved methods of the Australian Ballast Water Management Requirements (DAWE, 2020f)	Ballast Water Record System (electronic or hard copy).	Vessel Masters
	All vessels involved in oil spill response activities will be fitted with lights, signals, AIS transponders and navigation and communications equipment, as required by the *Navigation Act 2012*.	Pre-mobilisation inspection confirms that required navigation equipment is fitted to survey vessel to ensure compliance with the *Navigation Act 2012*.	Vessel Masters
	Consultation with relevant government agencies and stakeholders.	Consultation records.	SapuraOMV Senior HSE Specialist
	In consultation with WA DoT, a response waste management plan, which includes decontamination stations and waste storage, transport and disposal arrangements, will be prepared and implemented (including	Records demonstrate that a waste management plan was prepared and implemented, in consultation with WA DoT.	Incident Commander SapuraOMV Senior HSE Specialist

	establishment of a waste transfer station as per OPEP Section 5.3).		

9. Implementation Strategy

9.1 Health, Safety and Environmental Management System

SapuraOMV will operate under the HSEMS for the duration of the activity. The purpose of the HSEMS is to provide clear direction on managing HSE related risks, impacts or threats associated with its core business as an exploration and production company.

SapuraOMV's HSE objectives are to:

- Continuously provide a workplace:
  - That is free from injury or illness;
  - That promotes a healthy workplace and mitigates significant health risks; and
  - That has minimum environmental footprint.
- Continuously enhance operational integrity and safe behaviours through a continual focus on minimising HSE risks.

The HSEMS is built on four fundamental management principles:

- Leadership;
- Risk management;
- Effective implementation; and
- Continuous improvement.

These fundamental management principles are described in detail in the HSEMS.

The HSEMS framework (**Figure 9-1**) supports the implementation of these principles and ensures a systematic approach to plan, manage and carry out activities as intended. This is achieved through our continuous improvement cycle of Plan-Do-Check-Act.

In the context of this EP, the HSEMS and implementation strategy enables SapuraOMV to ensure that:

- Environmental impacts and risks continue to be identified and are reduced to ALARP;
- Control measures remain effective in reducing environmental impacts and risks to ALARP and acceptable levels;
- EPOs and EPSs are being met; and
- Stakeholder consultation is maintained, as appropriate.

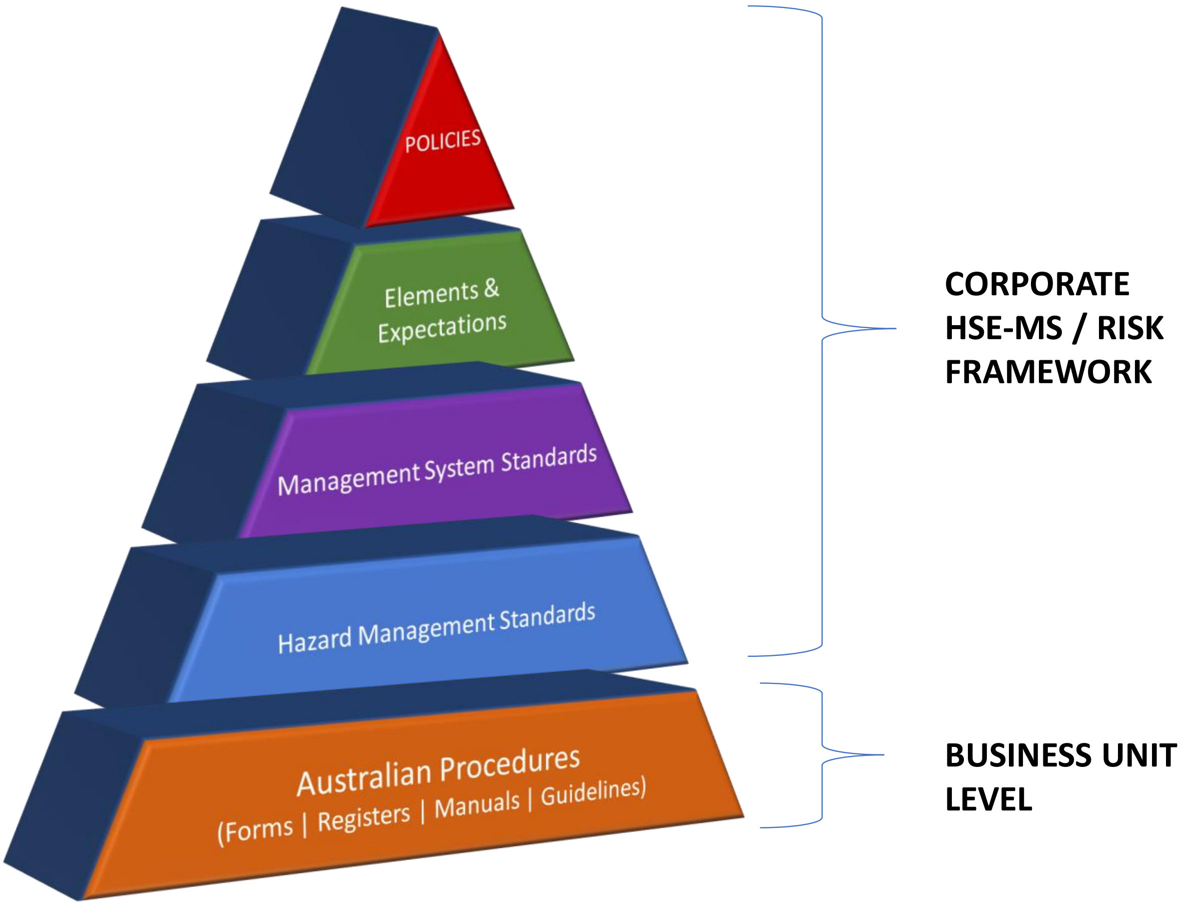


Figure 9-1 Corporate HSEMS framework structure

9.2 Organisation

9.2.1 Organisational Structure

The organisational structure relevant to the Kanga-1 site survey is outlined in **Figure 9-2**.

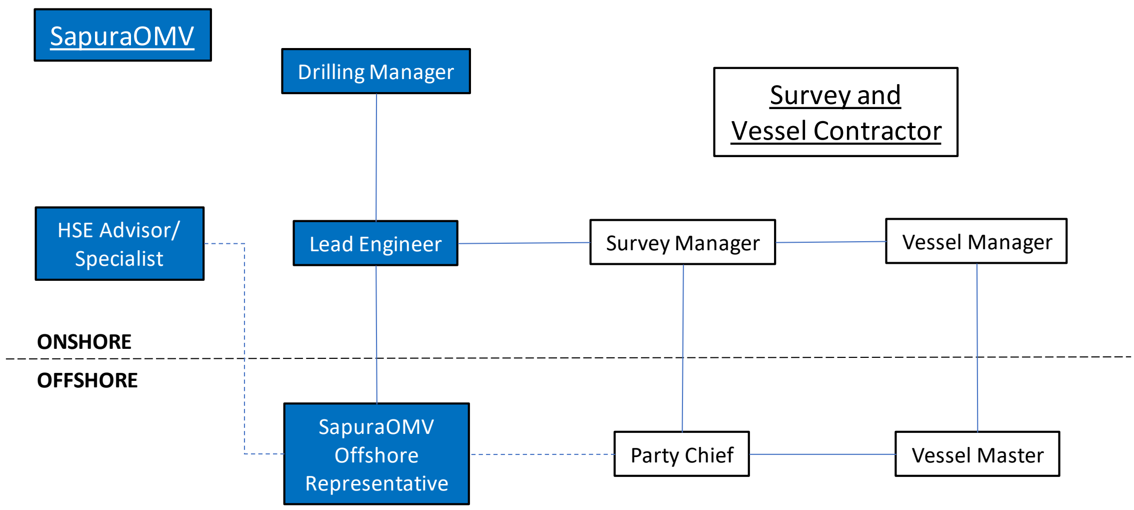


Figure 9-2 SapuraOMV's Kanga-1 site survey organisational structure

9.2.2 Roles and Responsibilities

The roles and responsibilities for the implementation, management and review for this EP are detailed in **Table 9-1.** Specific roles and responsibilities in the event of emergency spill response are detailed in the OPEP.

Table 9-1 Relevant roles and responsibilities

Role	Responsibilities
Country Manager	• Ensures company activities comply with appropriate legislation and company policies.
Lead Engineer	• Responsible for ensuring all HSE obligations and commitments are met. • Ensures activities are undertaken in accordance with this EP. • Ensuring personnel competency • Ensures the SapuraOMV Offshore Representative is provided with the resources required to ensure that the commitments in this EP are undertaken • Ensures reporting of environmental incidents meets external reporting requirements and SapurOMV incident reporting requirements • Assists with review, investigation and reporting of environmental incidents. • Facilitates the development and implementation of MoC documents. • Ensures activity pre-start and cessation notifications are issued. • Ensures corrective actions raised from environmental audits are tracked and closed out.
SapuraOMV Offshore Representative	• Confirms implementation of EP commitments during survey activities and records compliance with environmental commitments register. • Site focal point for onshore/offshore communications. • Participation in crew project induction. • Daily oversight of operations in conjunction with Vessel Party Manager and Vessel Master. • Participates in the investigation of any environmental incidents. • Reportable incidents are reported to the SapuraOMV Lead Engineer and/or Senior HSE Specialist and appropriate levels of incident investigation are undertaken and corrective actions from incidents are tracked to completion.
Senior HSE Specialist	• Responsible for oversight of this EP. • Prepares, maintains and distributes the environmental commitments register. • Provides HSE advice and guidance in relation to EP activity HSE matters. • Maintains and manages revisions of the EP as necessary. • Prepares (or delegates) environmental induction and vessel inspection information. • Provides (or delegates) a briefing to project personnel and vessel crew members of the environmental sensitivities of the activity, environmental management procedures and performance outcomes detailed in the EP as part of the environmental induction process. • Ensures stakeholder consultation is undertaken as per the requirements of the EP. • Assists in preparation of external regulatory reports required for the activity, in line with environmental approval requirements and SapuraOMV HSE incident reporting procedures. • Assists in the preparation of Environmental Performance Report.
Vessel Party Manager	• Oversight and reporting on the day-to-day conduct of the survey. • Verify operations are undertaken in a manner consistent with the EPOs and EPSs detailed in this EP.

Role	Responsibilities
	• Ensures the following: ○ Day-to-day activities are monitored for compliance against this EP. ○ The SapuraOMV Offshore Representative is immediately alerted: ▪ To proposed changes in operations that could impact negatively on environmental performance; or ▪ For proposed changes in operations that alter the environmental risk profile of the survey. ○ Procedures and work instructions required for survey operations are known, understood and followed. ○ Incidents are fully investigated and corrective actions monitored to close-out in accordance with the incident reporting requirements.
Vessel Master	• Has ultimate responsibility for the safe execution of vessel operations. • Verify vessel operations are undertaken in a manner consistent with the EPOs and EPS' detailed in this EP. • Ensures the following: ○ The vessel complies with all applicable maritime laws and regulatory requirements. ○ SOPEP and emergency drills and training are undertaken. ○ Incidents are investigated together with the Vessel Party Manager and corrective actions closed (as appropriate). ○ Auditing is undertaken as required by vessel procedures. ○ Equipment is maintained to requirements. ○ Statutory records (oil usage management records, waste management records, etc.) are maintained. ○ HSE related procedures and work instructions are known, understood and followed (e.g. toolbox meetings, HSE meetings). ○ Marine crew have attended the HSE induction and are competent relevant to their specific roles and responsibilities ○ Safe working codes and practices are implemented for vessel operations in accordance with recognised standards and policies
All Personnel	• Adhere to HSE obligations. • Following good housekeeping procedures and work practices. • Encouraging improvement wherever possible. • Report sightings of marine fauna and marine pollution. • Immediately reporting HSE incidents, hazards or non-conformances to the Vessel Party Manager or Vessel Master.
Marine Fauna Observer (if required)	• Supporting compliance with this EP with respect to marine fauna observations and interactions. • Ensuring compliance with the relevant management procedures in place for the survey, including EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales (adapted to include whale sharks). • Maintaining records of marine fauna sightings and operational response. • Daily and Final report submission to the SapuraOMV Senior HSE Specialist.
Incident Commander	• As per the OPEP, the Incident Commander leads the Incident ManagementTeam and is responsible for the overall management and support to the response operations of a spill from a fuel tank rupture incident.

9.3 Awareness, Training and Competency

9.3.1 Training and Competency

All members of the workforce on the survey vessel will complete relevant training and hold qualifications and certificates for their role (e.g. crane operator certificates, etc.).

SapuraOMV will contractually assure contractors maintain appropriate training and qualifications, and personnel qualification and training records will be sampled before and/or during the activity. Such checks will be performed during the procurement process, inductions, and/or operational inspections and audits.

SapuraOMV and its contractors are individually responsible for ensuring that their personnel are qualified and trained. The systems, procedures and/or responsible persons necessary to ensure that this commitment is met will vary (e.g. online databases, desktop matrix, staff on-boarding processes, training departments, etc.). All relevant marine personnel will be qualified in accordance with the International Convention on Standards of Training Certification and Watch Keeping for Seafarers (STCW95) or Elements of Shipboard Safety. Only MFOs (if required) with demonstrable and relevant experience will be engaged for the survey.

9.3.2 Environmental Awareness

Inductions are conducted for all personnel (including SapuraOMV representatives, contractors, subcontractors and visitors) before mobilising to or on arrival at the activity location. Inductions cover the HSE requirements under the SapuraOMV HSEMS, including information about the commitments contained in this EP.

The environmental content of these inductions includes the following:

- Environmental aspects of the activity;
- Ecological and socio-economic sensitivities of the activity location, including a ‘no recreational fishing policy’ to be implemented in the operational area;
- Relevant legislative requirements, standards and procedures;
- SapuraOMV’s HSE Policy;
- Monitoring and reporting performance outcomes and standards using measurement criteria;
- Oil spill preparedness and response; and
- Incident reporting requirements.

9.4 Compliance Assurance

9.4.1 Communication and Consultation

The SapuraOMV Lead Engineer will facilitate the communication of any HSE issues that may arise, via the daily report and daily progress meetings.

Stakeholder consultation specific to the Activity is detailed in **Section 5**.

9.4.2 Monitoring Records

Monitoring will be undertaken for the survey, and records kept as detailed in **Table 9-2**.

Table 9-2 Emissions and discharges monitoring requirements

Discharge	Parameter	Record	Monitoring Method	Responsibility

Atmospheric emissions	Volume of MDO used by survey vessel	Oil Record Book	Daily Report	Chief Engineer
Oily water discharges	Volume of oily water discharged from survey vessel	Oil Record Book	Daily Report	Chief Engineer
Food waste	Volume of food scraps discharged from survey vessel	Garbage Record Book	Daily Report	Vessel Master
Sewage/grey water discharge	Volume of sewage and grey water discharged from survey vessel	Engine Room log book	Daily Report	Chief Engineer
Hazardous wastes	Volume of hazardous wastes transferred onshore	Oil Record Book Garbage Record Book	Daily Report	Chief Engineer Vessel Master
Non-hazardous wastes	Volume of non-hazardous wastes transferred onshore	Garbage Record Book	Daily Report	Vessel Master

9.4.3 Environmental Performance Review

SapuraOMV will undertake an internal review of the environmental performance of the survey on completion. The review will consider:

- An evaluation of conformance with the compliance register (based on the environmental performance outcomes, standards and measurement criteria outlined in **Sections 7** and **8**);
- Potential for improvements to the implementation strategy included within the EP;
- Compliance with SapuraOMV’s Policies and Procedures; and
- The management of non-conformances identified during the survey, including reportable and recordable incidents.

The outcomes of the review will be circulated to relevant persons in SapuraOMV and to other stakeholders as appropriate. The outcomes of the review will be incorporated into environmental management measures applied to future activities to further improve SapuraOMV’s environmental performance, where relevant, and will be included in the Environmental Performance Report submitted to NOPSEMA.

9.4.4 Management of Change

Proposed changes to the survey activities as described in this EP will be managed in accordance with SapuraOMV’s Management of Change (MoC) Procedure (AU-HS-PRO-003-1.1). The MoC Procedure provides a systematic process to initiate, document, assess, authorise, communicate and implement changes or proposed changes to the Activity. The MOC process will also be used to manage any changes triggered by external factors, such as:

- New hazards or risks, e.g. new relevant person, or relevant person with new meritorious issues, gazetting of a new marine park;
- Legislation changes or government documents, such as changes to management plans, species recovery plans, conservation advice releases from DAWE;
- New publications, research or guidelines of relevance; and
- Outcomes of external audits, inspections and investigations.

The MoC Procedure considers the implications of any proposed change to the EP and/or OPEP currently in force whilst meeting regulatory requirements. If the change does not trigger revision under the OPGGS(E) Regulations, SapuraOMV will amend the EP and record the changes within the EP. If the MoC assessment determines that a change does trigger a revision of the EP, SapuraOMV will update the EP and re-submit it to NOPSEMA for acceptance as per **Section 9.4.5**).

Accepted MoCs become part of the in-force EP or OPEP, will be tracked, and where appropriate, SapuraOMV's environmental commitments register (ECR) will be updated to ensure changes to EPOs or EPSs are communicated to the workforce and implemented. Any MoC will be distributed to the relevant persons, and the most relevant management position (e.g. vessel masters) will ensure the MoC is communicated and implemented, which may include crew meetings/ briefings/ communications as appropriate for the change.

The MoC procedure will be periodically checked against NOPSEMA guidance to ensure ongoing compliance and will be undertaken as part of the compliance process. Monitoring of potential external triggers of change will be conducted via subscriptions to relevant government websites, journals and advices, as well as through the ongoing consultation process.

9.4.5 Environment Plan Revisions

In accordance with Regulation 17 of the OPGGS(E)R, a revision of this EP shall be submitted to NOPSEMA as per the following regulatory requirements:

- With the regulator's approval before the commencement of a new activity;
- Before the commencement of any significant modification or new stage of the activity that is not provided for in the EP as currently in force;
- Before, or as soon as practicable after, the occurrence of any significant new or significant increase in environmental impact or risk;
- The occurrence of a series of new or a series of increases in existing environmental impacts or risks which, taken together, amount to the occurrence of a significant new or significant increase in environmental impact or risk; or
- A change in titleholder that results in a change in the manner in which the environmental impacts and risks of an activity are managed.

9.4.6 Record Management

SapuraOMV will store operational documents and records that are relevant to the EP. Records generated for the petroleum activity will be retrievable and retained for five years after the day when the EP ceases to be in force. Operational documents and records associated with this EP will include:

- Project induction presentation and attendance records;
- Records relating to training and competency;
- Records of emissions and discharges;
- Daily activity reports;
- Management of change records;
- Consultation records;
- Incident notifications and investigation records;
- Recordable and reportable incident reports;
- Environmental commitments register; and
- Environmental performance report.

9.4.7 Reporting Requirements

9.4.7.1 Environmental Performance Report

In accordance with the OPGGS(E)R Regulation 14(2), SapuraOMV will submit a report on the environmental performance of the activity within three months of submission of an end-of-activity notification to NOPSEMA. Performance will be measured against the EPOs and EPSs described in this EP.

9.4.7.2 Incident Reporting

Notification and reporting requirements for environmental incidents to external agencies are provided in **Table 9-3** and **Appendix E** (OPEP).

Table 9-3 Regulatory incident reporting

Requirement	Timing	Contact
Recordable Incident A recordable incident is defined as: '…*a breach of an environmental performance outcome or standard in the environment plan that applies to the activity and is not a reportable incident.*' As a minimum, the written incident report must describe: • The incidents and all material facts and circumstances concerning the incidents; • Any actions taken to avoid or mitigate any adverse environmental impacts; • Any corrective actions already taken, or that may be taken, to prevent a repeat of similar incidents; and • If no recordable incidents occur during the reporting month, a 'nil report' will be submitted.	Before the 15th day of the following calendar month	NOPSEMA – submissions@nopsema.gov.au
Reportable Incident A reportable incident is defined as: '… *an incident relating to an activity that has caused, or has the potential to cause an adverse environmental impact; and under the environmental risk assessment process the environmental impact is categorised as moderate to significant environmental damage.*' Therefore, reportable incidents under this EP are those unplanned events that have a moderate or greater consequence severity level. In accordance with this definition, reportable incidents identified under this EP are: • Hydrocarbon spill (Level 2) – vessel collision; and • Introduction of invasive marine species.		
Verbal notification The notification must contain: • All material and circumstances concerning the incident; • Any action taken to avoid or mitigate the adverse environmental impact of the incident; and	As soon as practicable, but no later than two hours of the incident having been identified	NOPSEMA – 1300 674 472

Requirement	Timing	Contact
• The corrective action that has been taken or is proposed to be taken to stop control or remedy the reportable incident.		
Written notification Verbal notification of a reportable incident to the regulator must be followed by a written report. As a minimum, the written incident report will include: • The incident and all material facts and circumstances concerning the incident; • Actions taken to avoid or mitigate any adverse environmental impacts; • The corrective actions that have been taken, or may be taken, to prevent a recurrence of the incident; and • The action that has been taken or is proposed to be taken to prevent a similar incident occurring in the future.	Within 3 days of notification of incident	NOPSEMA – submissions@nopsema.gov.au
Written notification Incident reports must be submitted to NOPTA.	Within 7 days of written report submission to NOPSEMA	NOPTA – reporting@nopta.gov.au
AMSA • All slicks trailing the vessel; • All spills in Australian Commonwealth waters (notwithstanding the size or amount of oil or sheen); and • All spills where National Plan equipment is used in response.	Immediate notification by Vessel Master	1800 641 792 (Emergency) (02) 6230 6811 (Office)
Written notification	Written Marine Pollution Report (POLREP) for submitted by Vessel Master; timing not specified.	AMSA POLREP: https://www.amsa.gov.au/environment/maritime-environmentalemergencies/nationalplan/Contingency/Oil/documents/Appendix7.pdf
Vessel strike with marine mammals	Within 72 hours	DAWE – Online national Ship Strike Database https://data.marinemammals.gov.au/report/shipstrike
Injury to or death of EPBC Act-listed species	Within 7 days	DAWE – 1800 803 772 protected.species@environment.gov.au
Suspected or confirmed IMS introduction	Verbal notification ASAP	DPIRD Dishwatch – 1800 815 507 biosecurity@fish.wa.gov.au
Identification of item of underwater cultural heritage such as vessel or aircraft remains and/or associated relics	Written notification	UnderwaterHeritage@environment.gov.au

9.5 Emergency Management and Response

In the event of an emergency, the Vessel Master will assume overall onsite command, will make the initial regulatory notifications to AMSA as defined in **Table 9-3** and will act as onsite coordinator directed by AMSA. All persons aboard the vessel will be required to act under the direction of the Vessel Master.

The survey vessel will have equipment on board for responding to emergencies, including but not limited to medical equipment, firefighting equipment and oil spill response equipment as defined in the SOPEP. The vessel SOPEP is the emergency plan and the Vessel Master is responsible for managing the onboard response to small Level 1 spills (<10 m^3).

In the event of a worst case Level 2 spill (10-1,000 m^3) spill from a fuel tank rupture, SapuraOMV will activate its Incident Management Team to assist AMSA as a Supporting Agency as per the Oil Pollution Emergency Plan (OPEP) (**Appendix E**). In order to encompass the nature and scale of the survey and respond to the identified worst case credible spill scenario from a fuel tank rupture (**Section 8.1**), the OPEP encompasses multiple levels of planning and response capability, including, but not limited to:

- Vessel SOPEP to control the source of the spill (e.g. pump from rupture tank) and response equipment to contain the spill, which can be managed by the vessel; and
- The National Plan for Maritime Environmental Emergencies (National Plan) (AMSA, 2014) where AMSA is the Jurisdictional Authority and Control Agency for spills from vessels which affect Commonwealth waters.

SapuraOMV has insurance policies in place that would cover the costs of clean-up or remediation activities following a spill. These policies cover activities in Australian Commonwealth and State waters (if required) and are therefore applicable to the whole of the survey.

In the unlikely event of a worst case Level 2 MDO spill, the OPEP Notification Plan provides the contact details and timing to notify Commonwealth, State and support agencies. In addition, SapuraOMV will advise potentially affected stakeholders identified in **Section 5.3**.

9.5.1 Testing Spill Response Arrangements

In accordance with Regulation 14(8A) and (8C) of the OPGGS(E)R, the response arrangements will be tested:

- When they are introduced;
- When they are significantly amended; and
- No later than 12 months after the most recent test.

Prior to commencing the Kanga-1 geophysical and geotechnical site survey, spill response arrangements applicable to the survey vessel will be tested. Outcomes of the test will be documented and lessons learnt recorded.

All nominated personnel in the Kanga-1 Site Survey OPEP will be trained to an appropriate level to undertake their role in its implementation. Classroom training will be supported by drills and exercises to ensure that competencies are maintained.

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Appendices

Appendix A – SapuraOMV HSE Policy

Health, Safety and Environmental Policy

SapuraOMV Upstream Sdn. Bhd. recognizes that implementing good Health, Safety & Environmental (HSE) management is critical to achieving, maintaining and continually improving operational excellence for long term business sustainability.

In line with this aspiration, we shall comply with all applicable HSE legal requirements and other requirements in the country we operate.

We remain committed towards prevention of work place injuries, occupational illnesses, property damages and minimizing our impact on the environment through pollution prevention, emissions reduction and waste recycling by:

- establishing, implementing and improving Health, Safety and Environmental Management System (HSEMS) to ensure continual improvement in HSE management and performance;
- managing all HSE risks associated with our business activities and provide control measures to eliminate or reduce all HSE risks to as low as reasonably practicable (ALARP) to our employees, subcontractors, vendors, stakeholders, and to the environment;
- demonstrating leadership commitment, assuring responsibility and accountability at management and supervisory levels in championing HSE initiatives and ensuring compliance with HSE policies and procedures;
- periodically measuring and reviewing HSE performance against HSE objectives and standards;
- ensuring asset integrity and reliability of facilities, equipment and processes to safeguard our people, the environment, our asset and our reputation;
- incorporating HSE performance indicator targets for senior management staff and all employees;
- providing adequate resources including competent human resources to achieve HSE objectives;
- continually developing our employees' skills and competencies through training opportunities;
- encouraging a proactive intervention culture and transparency in HSE reporting as an integral part of our HSE best practice; and
- communicating the essence and intent of this policy to our employees and other stakeholders.

SapuraOMV Upstream Sdn. Bhd. employees and other stakeholders including subcontractors, vendors, suppliers and visitors shall remain fully committed to achieving the objectives of this policy.

MAMDOUH BADAWI	**MUHAMMAD ZAMRI JUSOH**	**WOLFGANG STOCK**
Chief Operating Officer	Chief Executive Officer	Chief Financial Officer

22nd July 2019

Appendix B – Legislation

Legislation	Summary	Related International Conventions	Administering Authority
Australian Ballast Water Requirements, Version 8	Australian Ballast Water Management Requirements set out the obligations on vessel operators with regards to the management of ballast water and ballast tank sediment when operating within Australian seas. These requirements are enforceable under the Biosecurity Act 2015.	• International Convention for the Control and Management of Ships' Ballast Water and Sediments (adopted in principlein 2004 and in force on 8 September 2017).	DAWE
Australian Maritime Safety Authority Act 1990 (AMSA Act)	This Act specifies that the Australian Maritime Safety Authority's (AMSA) role includes protection of the marine environment from pollution from ships and other environmental damage caused by shipping. This Act facilitates international cooperation and mutual assistance in preparing and responding to a major oil spill incident and encourages countries to develop and maintain an adequate capability to deal with oil pollution emergencies. Requirements are given effect through AMSA. AMSA is the lead agency for responding to oil spills in the marine environment and is responsible for the Australian National Plan for Maritime Environmental Emergencies (NatPlan).	• International Convention on Oil Pollution Preparedness, Response and Cooperation 1990; • Protocol on Preparedness, Response and Cooperation to pollution Incidents by hazardous and Noxious Substances 2000; • International Convention Relating to Intervantion on the High Seas in Cases of Oil Pollution Casualties 1969; and • Articles 198 and 221 of the United Nations Convention on the Law of the Sea 1982.	AMSA
Biosecurity Act 2015 Biosecurity Regulations 2016	This Act replaced the *Quarantine Act 1908* in 2015 and provides the Commonwealth with powers to take measures of quarantine, and implement related programs as are necessary, to prevent the introduction of any plant, animal, organism or matter that could contain anything that could threaten Australia's native flora and fauna or natural environment. This Act includes mandatory controls on the use of seawater as ballast in ships and the declaration of sea vessels voyaging out of and into Commonwealth waters. The Regulations stipulate that all information regarding the voyage of the vessel and the ballast water is declared correctly to the quarantine officers.	• International Convention for the Control and Management of Ships' Ballast Water and Sediments (adopted in principlein 2004 and in force on 8 September 2017).	DAWE

Legislation	Summary	Related International Conventions	Administering Authority
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	This Act applies to actions that have, will have or are likely to have a significant impact on matters of national environmental or cultural significance. This Act is the Australian Government's key piece of environmental legislation. The Act protects matters of national environmental significance (MNES) and provides for a Commonwealth environmental assessment and approval process for actions. There are eight MNES, these being: • World heritage properties; • Ramsar wetlands; • Listed Threatened species and communities; • Listed Migratory species under international agreements; • Nuclear actions; • Commonwealth marine environment; • Great Barrier Reef Marine Park; and • Water trigger for coal seam gas and coal mining developments. Australian Marine Park Management Plans were also developed under this Act. The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is the sole assessor for offshore petroleum activities in Commonwealth water (as of 28 February 2014). Under the new arrangements, environmental protection will be met through NOPSEMA's decision-making processes.	• 1992 Convention on Biological Diversity and 1992 Agenda 21, • Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973, • Agreement between the Government and Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment 1974; • Agreement between the Government and Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment 1986; • Agreement between the Government of Australia and the Government of the Republic of Korea on The Protection of Migratory Birds 2006; • Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (Ramsar); • International Convention for the Regulation of Whaling 1946; and • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979.	DAWE
Environment Protection and Biodiversity Conservation Regulations 2000	Part 8 of the regulations provide distances and actions to be taken when interacting with cetaceans.	NA	DAWE

Legislation	Summary	Related International Conventions	Administering Authority
Marine Pest Plan 2018 – 2023: the National Strategic Plan for Marine Pest Biosecurity	The vision of the Marine Pest Plan is: '*Maintaining Australia's healthy and resilient marine environment that is protected from the threat of marine pests, and which supports our economy and social amenity*.' While the vision sets the broad direction for the future of marine pest biosecurity in Australia, Marine Pest Plan 2018–2023 describes the steps to make this vision a reality, and the outcomes to achieve.	NA	DAWE
Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007	An Act to amend the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, and for other purposes. This amended Act provides the protection of the sea from air pollution from ships.	• MARPOL (certain sections).	AMSA
National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry 2009	The guidance document provides recommendations for the management of biofouling hazards by the petroleum industry.	NA	DAWE
National Greenhouse and Energy Reporting Act 2007	Introduces a single national reporting framework for the reporting and dissemination of information about greenhouse gas emissions, greenhouse gas projects and energy production and consumption.	• United Nations Framework Convention on Climate Change 1992; and • The Kyoto Protocol	Climate Change Authority
National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds	The Guidelines outline the process to be followed where there is the potential for artificial lighting to affect wildlife. They apply to new projects, lighting upgrades (retrofitting) and where there is evidence of wildlife being affected by existing artificial light.	NA	DAWE
National Strategy for Reducing Vessel Strike	The overarching goal of the strategy is to provide guidance on understanding and reducing the risk of vessel collisions and the impacts they may have on marine megafauna.	NA	DAWE

Legislation	Summary	Related International Conventions	Administering Authority
on Cetaceans and other Marine Megafauna			
Navigation Act 2012	This Act regulates ship-related activities. An act regulating navigation and shipping including Safety of Life at Sea (SOLAS). A number of Marine Orders enacted under this Act apply directly to offshore petroleum exploration and production activities: • Marine Order 21: Safety and Emergency Arrangements • Marine Order 27: Safety of Navigation and Radio Equipment • Marine Order 30: Prevention of collisions • Marine Order 31: SOLAS and non-SOLAS certification • Marine Order 58: Safe Management of Vessels • Marine Order 70 – Seafarer Certification	• MARPOL (certain sections); • International Convention for the Safety of Life at Sea 1974; and • COLREG 1972	AMSA
Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGSA) Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R)	The Act addresses all licensing, health, safety, environmental and royalty issues for offshore petroleum exploration and development operations extending beyond the three-nautical mile limit. The OPGGS Act contains a broad requirement for titleholders to operate in accordance with "good oil-field practice". The OPGGS Environment Regulations provide an objective based regime for the management of environmental performance for Australian offshore petroleum exploration and production activities in areas of Commonwealth jurisdiction. Key objectives of the Environment Regulations include: • To ensure operationa are carried out in a way that is consistent with the principles of ecologically sustainable development; • To adopt best practice to achieve agreed environment protection standards in industry operations; and	NA	NOPSEMA

Legislation	Summary	Related International Conventions	Administering Authority
	• To encourage industry to continuously improve its environmental performance.		
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994	This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. This Act disallows any harmful discharge of sewage, oil and noxious substances into the sea and sets the requirements for a shipboard waste management plan. The following Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78: • Marine Order 91: Marine Pollution Prevention - Oil • Marine Order 93: Marine Pollution Prevention - Noxious Liquid Substances • Marine Order 94: Marine Pollution Prevention - Packaged Harmful Substances • Marine Order 95: Marine Pollution Prevention – Garbage • Marine Order 96: Marine Pollution Prevention – Sewage • Marine Order 97: Marine Pollution Prevention - Air Pollution	• MARPOL (certain sections).	AMSA
Protection of the Sea (Harmful Antifouling Systems) Act 2006	This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the use of harmful organotins in ant-fouling paints used on ships. The Act also provides that Australian ships must hold 'anti-fouling certificates', provided they meet certain criteria. This is enacted by Marine Order 98 (Marine Pollution – Anti-fouling Systems) 2013	• International Convention on the Control of Harmful Anti-fouling Systems on Ships 2001	AMSA

Legislation	Summary	Related International Conventions	Administering Authority
Underwater Cultural Heritage Act 2018	This Act replaces *the Historic Shipwrecks Act 1976*. It protects the heritage values of remains of vessels, aircraft and certain associated articles that have been in Commonwealth waters for at least 75 years. Vessels and aircraft that have been underwater less than 75 years, and other types of underwater cultural heritage, can be protected through individual declaration based on an assessment of heritage significance. It also increases penalties applicable to damaged sites. The Act came into effect on 1 July 2019.	• Agreement between the Netherlands and Australia concerning old Duch Shipwrecks 1972	DAWE

Appendix C – EPBC Act Protected Matters Search

Appendix C.1 Operational Area (4 km by 4 km)

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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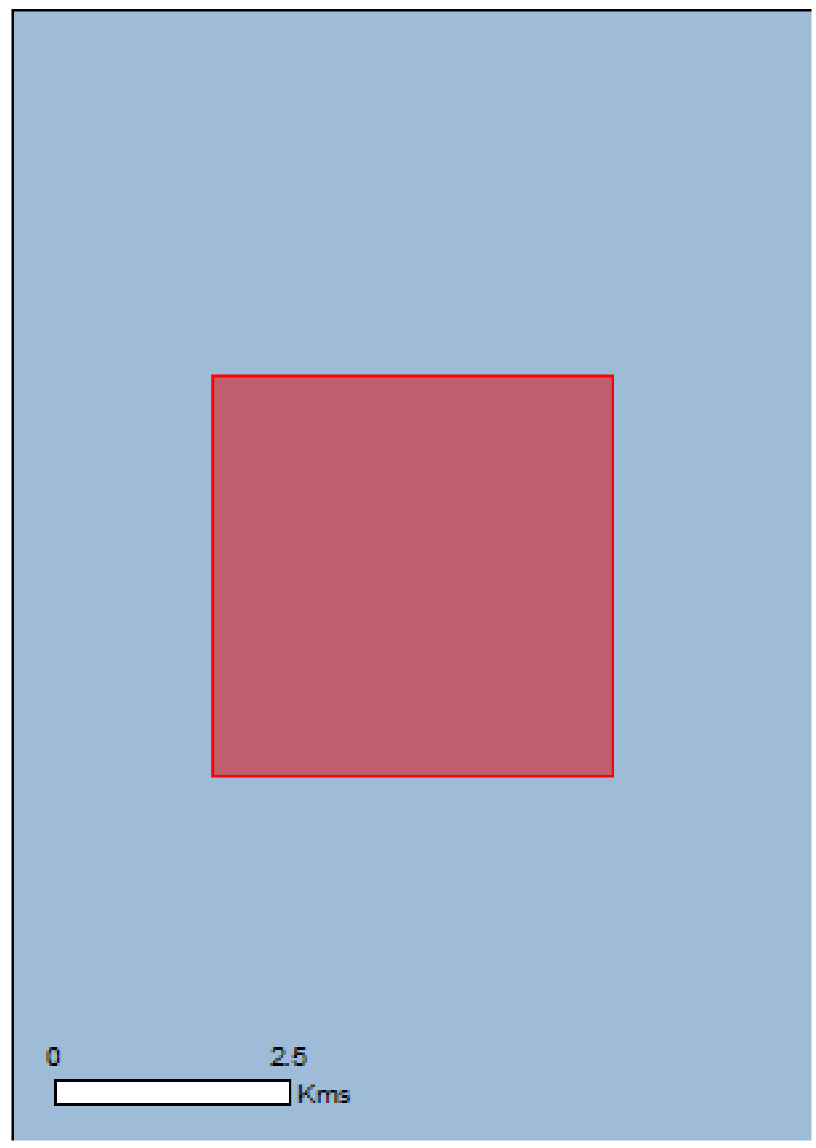

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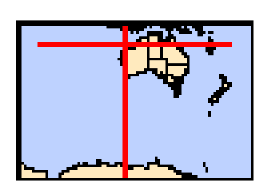

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	14
Listed Migratory Species:	30

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	53
Whales and Other Cetaceans:	22
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Fish		
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Extra Information

Caveat
The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-19.33535 116.33841,-19.29919 116.3384,-19.29919 116.37647,-19.33535 116.37648,-19.33535 116.33841

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix C.2 Diesel Spill MEZ

Australian Government

Department of the Environment and Energy

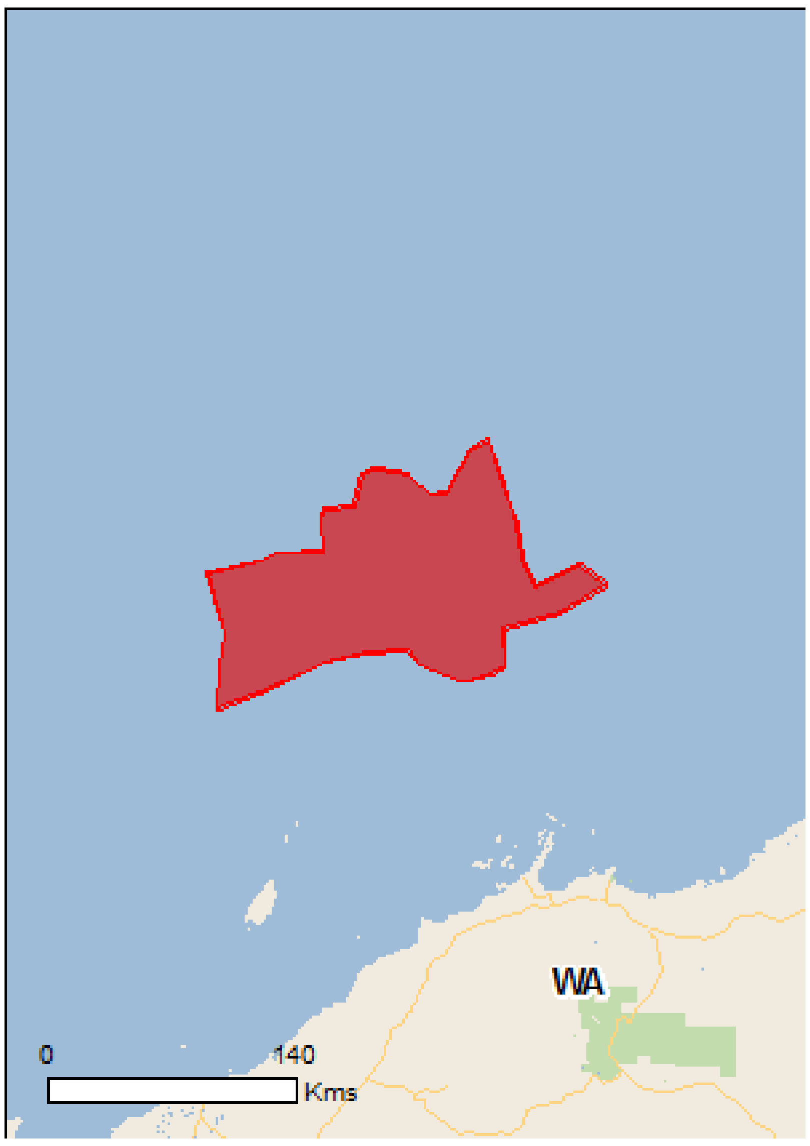
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

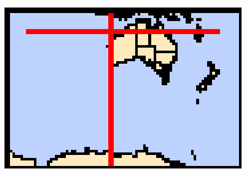
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 31/03/20 14:00:37



Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	17
Listed Migratory Species:	31

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	56
Whales and Other Cetaceans:	25
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	3

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area

Name	Threatened	Type of Presence
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Fish		

Name	Threatened	Type of Presence
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Continental Slope Demersal Fish Communities	North-west
Glomar Shoals	North-west

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-19.6324 115.71346,-19.77707 115.37463,-19.85131 115.17095,-19.66095 115.18046,-19.49724 115.21092,-19.21361 115.11955,-19.15432 115.38898,-19.1172 115.48131,-19.10863 115.70783,-18.94902 115.69651,-18.9055 115.71942,-18.89693 115.86123,-18.73608 115.90787,-18.71419 115.95927,-18.72656 116.08205,-18.74274 116.13344,-18.83411 116.24195,-18.83268 116.32904,-18.62139 116.45324,-18.5757 116.53938,-18.78319 116.60981,-18.97736 116.68024,-19.14344 116.70499,-19.27669 116.7759,-19.17628 117.00575,-19.25956 117.12596,-19.27193 117.12787,-19.39275 116.90349,-19.47306 116.61081,-19.65302 116.62089,-19.69204 116.55998,-19.72059 116.43434,-19.72059 116.39818,-19.64572 116.19697,-19.57323 116.13231,-19.59052 115.92286,-19.6324 115.71346

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix C.3 Diesel Spill EMBA

Australian Government
Department of the Environment and Energy

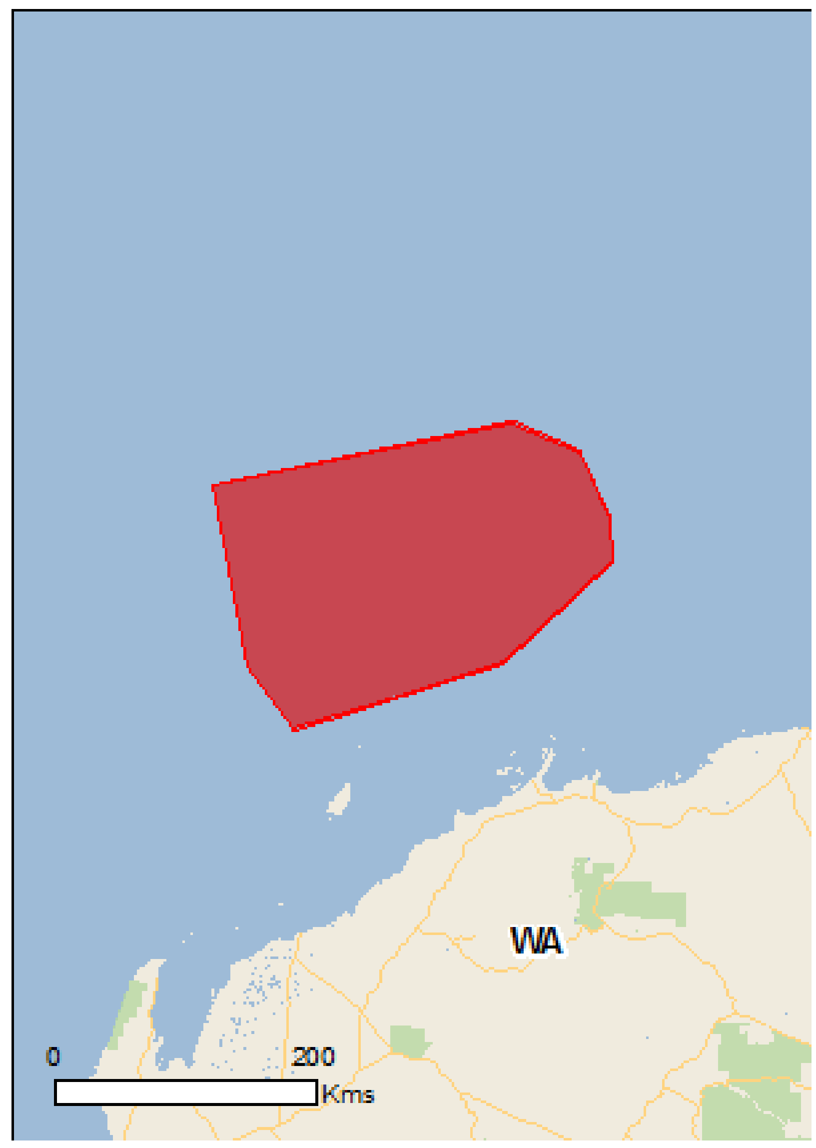
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

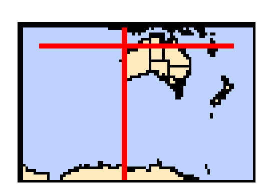
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 31/03/20 13:59:36



Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	20
Listed Migratory Species:	36

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	70
Whales and Other Cetaceans:	27
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	3

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Migratory Marine Species		

Name	Threatened	Type of Presence
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat likely to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans

[Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area

Name	Status	Type of Presence
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label
Montebello	Multiple Use Zone (IUCN VI)

Extra Information

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Continental Slope Demersal Fish Communities	North-west
Glomar Shoals	North-west

Caveat
The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-18.73669 114.52092,-18.32948 116.58171,-18.52174 117.04428,-18.95493 117.2472,-19.22904 117.26433,-19.88387 116.51623,-20.31588 115.07261,-19.91452 114.75113,-18.73669 114.52092

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix D – Environment Plan Consultation

Introduction to SapuraOMV Upstream (Western Australia) Pty Ltd and Drilling of Kanga-1

SapuraOMV Australia Kanga <kanga.australia@sapura-omv.com>
Tue 28/01/2020 5:26 PM
To: SapuraOMV Australia Kanga <kanga.australia@sapura-omv.com>

1 attachments (1 MB)
SapuraOMV Intro Letter and Kanga-1 Project Fact Sheet - January 2020.pdf;

Dear Sir/ Madam,

SapuraOMV is planning to drill a single exploration well (Kanga-1) in the WA-412-P permit area, located in the Carnarvon Basin, off north-western Australia. You have been identified as one whose interest or activities may be affected by the drilling activity. Please see attached for a letter and fact sheet introducing SapuraOMV and describing the Kanga-1 Project.

We value your comments and feedback, and would welcome your input at your earliest opportunity and preferably prior to 28 February 2020 should you have any comments/ feedback on the proposed activity. Comments/ feedback can be made via email, letter or phone. Our contact details can be found in the attached letter and fact sheet.

Thank you.

Regards,

SapuraOMV Upstream (WA) Pty Ltd
Level 2, 251 St Georges Terrace,
Perth, Western Australia, 6000.
T: 1800 959 553
E: kanga.australia@sapura-omv.com
www.sapura-omv.com

Dear Sir/Madam

RE: Introduction to SapuraOMV Upstream (Western Australia) Pty Ltd and Drilling of Kanga-1

SapuraOMV Upstream (Western Australia) Pty Ltd (SapuraOMV), is a wholly owned subsidiary of SapuraOMV Upstream Sdn Bhd, which is a strategic partnership between Sapura Energy Berhad and OMV AG. SapuraOMV is a leading independent oil and gas company with operating assets in Malaysia and exploration interests in Australia, New Zealand and Mexico.

SapuraOMV recognises that the implementation of good Health, Safety and Environment (HSE) practices are not only essential but critical to the achievement of operational excellence. We are committed to implementing our HSE management system in accordance with international standards to minimise HSE risk to people, stakeholders and the environment.

SapuraOMV plans to drill a single exploration well (Kanga-1) in the WA-412-P permit area located in the Carnarvon Basin, off north-western Australia.

You have been identified as one whose interest or activities may be affected by the drilling activity. A Project Fact Sheet is attached, which provides background information on the proposed activity, including a summary of potential key risk and associated management measures.

Your feedback on the proposed activity and our response will be included in the Environment Plan for the activity, which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for approval. Under the new public transparency arrangements by NOPSEMA, the Environment Plan will be published in full on the NOPSEMA website. Therefore, please advice SapuraOMV if you do not wish for any part of your feedback to be published. This will allow for us to utilise the information received in our assessment while maintaining confidentiality.

The SapuraOMV office is based in Perth, Western Australia. Our contact details can be found below. Enquiries related to the Kanga-1 Project must be addressed to the email kanga.australia@sapura-omv.com or by telephone on 1800 959 553. These contact details are included in the attached Kanga-1 Project Fact Sheet – January 2020.

Yours faithfully

Zamin Zawawi
Country Manager, Australia

Att: Kanga-1 Project Fact Sheet – January 2020

SapuraOMV Upstream (WA) Pty Ltd
(Formerly known as Sapura Exploration and Production (WA) Pty Ltd)
Level 2, 251 St Georges Terrace, Perth, 6000, Australia
T +618 6118 4990 | **Email** enquiries.australia@sapura-omv.com | **www.sapura-omv.com**

Kanga-1 Project Fact Sheet – January 2020

Background

SapuraOMV Upstream (Western Australia) Pty Ltd (SapuraOMV) proposes to drill the Kanga-1 exploration well within petroleum exploration permit area WA-412-P, in the Carnarvon Basin offshore north-western Australia. A pre-drilling seabed survey around the proposed well site will be undertaken prior to drilling activities.

As part of the development of the Environment Plan for the drilling campaign, we are assessing the environmental and socioeconomic values of the area of our proposed activities and how they may be affected by the proposed activities. Ongoing consultation with stakeholders is an important part of our management of impacts, and we welcome your input and feedback.

Activity Location

The proposed Kanga-1 well is located approximately 160 km north-northwest of Karratha (Figure 1; Table 1), in water depths of approximately 147 m.

The petroleum activities will be conducted in the Operational Area, measuring approximately 4 km by 4 km around the well location (Table 2). The Operational Area is not located within any Marine Protected Areas and is outside of established shipping fairways.

The Operational Area includes a 500 m exclusion zone around the Mobile Offshore Drilling Unit (MODU). This is will only be in place for the duration of the activity, while the MODU is in the Operational Area.

Table 1: Approximate Coordinates for Kanga-1 Well[1]

Latitude	Longitude
19° 19' 02.30" S	116° 21' 26.80" E

Table 2: Operational Area Approximate Coordinates

Latitude	Longitude
19° 20' 07.27" S	116° 20' 18.28" E
19° 17' 57.06" S	116° 20' 18.28" E
19° 17' 57.06" S	116° 22' 35.31" E
19° 20' 07.27" S	116° 22' 35.31" E

[1] The final well location is subject to site survey results and may move up to 1 km in the event of unforeseen drilling difficulties (i.e. respud)

Activity Duration

The drilling campaign (including seabed survey) is expected to take 40-50 days (excluding weather and operational delays), and is planned to begin between October 2020 and October 2021. Stakeholders will be notified of the commencement date, once confirmed.

The MODU and vessels will operate on a 24-hour basis, 7 days a week.

Pre-Drilling Survey

The proposed pre-drilling seabed survey will be undertaken in the Operational Area. The survey will use standard seabed survey techniques to identify any hazards that affect the location of the MODU. Data acquired will also inform planning for drilling the well.

Drilling Campaign

One exploration well will be drilled using a semi-submersible MODU. The MODU will be towed to location and anchored over the well site.

Once positioned, the MODU will be supported by support vessels and helicopters. Support vessels will be stationary or operating at slow speeds while working in the Operational Area. Helicopter frequency is expected to be several times per week. The supply base is expected to be in the Port of Dampier.

Environmental Considerations

In accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*, the Environment Plan for the petroleum activity will include a comprehensive risk assessment of all potential environmental impacts and risks from the activity, including those associated with emergency conditions. The sensitivities considered in the EP will include (but not be limited to):

- Presence of listed threatened or migratory species or threatened ecological communities identified in EPBC Protected Matter searches.
- Presence of Biologically Important Areas (BIAs) and habitats critical to the survival of marine fauna.
- Presence of important fauna behaviours (e.g. foraging, roosting or breeding) by fauna, including those identified in EPBC Protected Matter searches.

- Habitat values to other receptors (e.g. nursery habitat, food source, commercial species).
- Importance to human activities (e.g. recreation and tourism, aesthetics, economy).

The Environment Plan will be available on NOPSEMA's website for public comment prior to NOPSEMA's assessment.

The proposed pre-drilling seabed survey and drilling activities are standard industry practices involving established techniques and managed according to recognised standards and guidelines.

A summary of the potential hazards and risks relevant to offshore drilling campaign and associated management measures for planned activities and unplanned events is provided in Table 3.

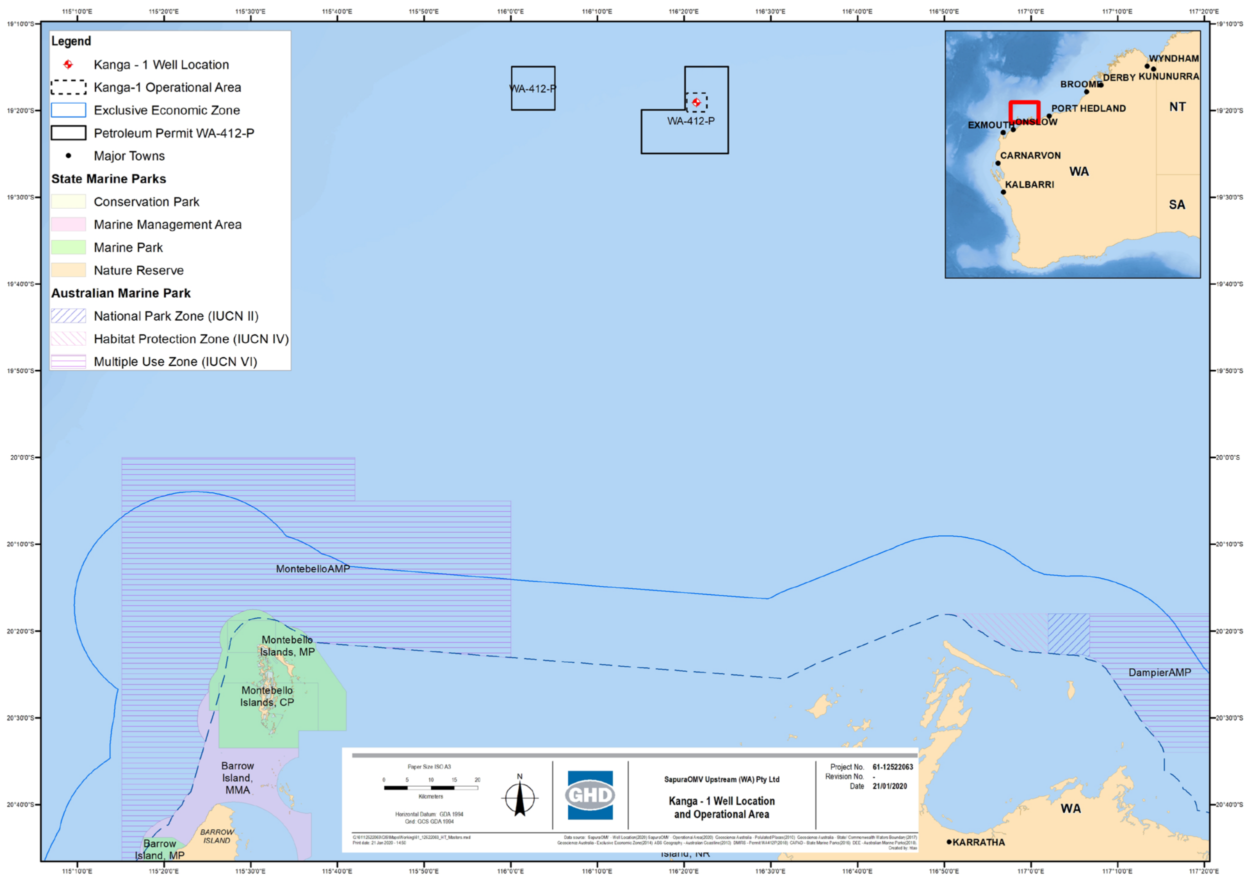


Figure 1: Location of Kanga-1 Well and Operational Area

Table 3: Summary of key risks/ hazards and standard management measures (assessed impacts/risks and associated management measures will be provided in Fact Sheet 2)

Potential Risks / Hazards	Standard Management and/or Mitigation Measures
Planned Events/ Hazards	
Physical presence: interaction with other marine users	• Relevant stakeholders will be notified prior to commencement of activities. • Notice to Mariners issued in advance of the pre-drilling survey and drilling program. • A 500 m radius exclusion zone will be in place around the MODU for the duration of the activity. • MODU and vessel bridge-watch will be maintained 24 hours/ day to assist with early detection of approaching vessels. • Recreational fishing by MODU/vessel crew will be prohibited during the activity.
Physical presence: seabed disturbance	• MODU positioning according to MODU move procedure and based on pre-drilling survey (to identify and address well-specific hazards). • Objects dropped overboard are recovered (where possible).
Emissions: noise	• Noise emitting equipment will be maintained in accordance with planned maintenance systems to reduce risk of excessive noise due to poor maintenance. • Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with Cetaceans: ○ To minimise risks of interference from vessels and helicopters, unless an action is reasonably necessary to prevent a risk to human health or to deal with an emergency.
Emissions: light	• Lighting will be kept to minimum while still meeting navigation and workplace safety requirements.
Emissions: atmospheric emissions	• MODU/vessels marine diesel (fuel oil) sulphur content compliant with MARPOL/AMSA Marine Order.
Marine discharges: routine/ operational and domestic	• All routine marine discharges and waste treatment systems will be meet MARPOL requirements and are routinely managed. • Chemical use will be managed in accordance with SapuraOMV's Chemical Selection Procedure.
Marine discharges: drilling related	• Only water-based drill fluids will be used (i.e. no synthetic based drill fluids). • Drilling fluids program and drill cuttings management system will be in place.
Waste generation	• Wastes generated onboard the vessels and MODU will be managed in accordance with legislative requirements and a Waste Management Plan.
Unplanned Events/ Risks	
Introduction of invasive marine species (IMS)	• MODU and vessels will be assessed and managed as appropriate to prevent the introduction of IMS. • Compliance with Australian biosecurity requirements and guidance.
Marine fauna interactions	• Implementation of EPBC Regulations (Part 8) for interacting with cetaceans to minimise disturbance to marine fauna caused by vessels and helicopter operations. • Environmental awareness inductions will be provided to crew prior to the activities, including marine fauna interaction requirements and reporting arrangements.
Unplanned releases including hydrocarbons	• MODU and vessels have appropriate spill response plans; spill response equipment and materials will be maintained and available on-board. • Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment. • All personnel undertaking activities will undergo relevant inductions and training. • Procedures will be in place for equipment maintenance, inspections and bunding. • All offshore activities will be managed in accordance with lifting and transfer procedures. • The MODU will have an accepted Safety Case and Well Operations Management Plan (WOMP). • An accepted Environment Plan and Oil Pollution Emergency Plan (OPEP) will be in place and the OPEP will be implemented in the event of a loss of well control. • An assistance Memorandum of Understanding (MoU) will be in place with major operators via the Australian Marine Oil Spill Centre (AMOSC).

Contact Details and Further Information

We welcome your response to understand how SapuraOMV's proposed activities may impact on your interests, together with any feedback on potential risks and impacts associated with the proposed activities.

We appreciate your input and any comments you may have for our consideration in the development of the Environment Plan. Should you wish to provide us with comments, please do so at your earliest convenience. Alternatively, if you would like to opt out of future communications, please let us know.

Email: kanga.australia@sapura-omv.com

Phone: 1800 959 553

Mail: SapuraOMV Upstream (WA) Pty Ltd
PO Box 7990
Cloisters, Western Australia, 6000

Kanga-1 Pre-drilling Site Survey

SapuraOMV Australia Kanga <kanga.australia@sapura-omv.com>
Tue 21/04/2020 7:15 PM
To: SapuraOMV Australia Kanga <kanga.australia@sapura-omv.com>

1 attachments (427 KB)
SapuraOMV Kanga-1 Project Fact Sheet - April 2020.pdf;

Dear Sir/ Madam,

In January 2020, SapuraOMV advised of our proposal to drill the Kanga-1 exploration well and undertake an associated pre-drilling site survey in the WA-412-P permit area, located in the Carnarvon Basin, off north-western Australia. You were identified as one whose interest or activities may be affected by the Kanga-1 project. Please see attached for an updated fact sheet, with further details on the activities involved in the pre-drilling site survey.

We value your comments and feedback, and would welcome your input at your earliest opportunity should you have any comments/ feedback on the proposed activity. Comments/ feedback can be made via email, letter or phone. Our contact details can be found in the attached fact sheet.

Thank you.

Regards,

SapuraOMV Upstream (WA) Pty Ltd
Level 2, 251 St Georges Terrace,
Perth, Western Australia, 6000.
T: 1800 959 553
E: kanga.australia@sapura-omv.com
www.sapura-omv.com

Kanga-1 Project Fact Sheet – April 2020

Background

In January 2020, SapuraOMV Upstream (Western Australia) Pty Ltd (SapuraOMV) advised of its intent to drill the Kanga-1 exploration well and undertake an associated pre-drilling site survey in petroleum exploration permit area WA-412-P of the Carnarvon Basin of north-western Australia.

This Fact Sheet provides an update on the project, including further detail on the activities involved in the pre-drilling site survey, the potential impacts and risks that have been identified and the management that will be implemented to avoid or minimise those impacts/risks.

Details for the drilling of the Kanga-1 exploration well will be distributed in a separate Fact Sheet.

Ongoing consultation with stakeholders is an important part of our management of impacts, and we welcome your input and feedback.

Environmental Planning

As part of the preparatory work required to determine the optimal well location, a geophysical and geotechnical site survey is required to assess surface and shallow subsurface characteristics and potential geohazards in the area.

SapuraOMV is preparing separate Environment Plans (EPs) for the site survey and the exploration well to meet the requirements of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*. As part of the development of the EP for the site survey, a comprehensive risk assessment of all potential environmental impacts and risks from the activity, including those associated with emergency conditions, has been completed.

The EP will be published on NOPSEMA's website.

Activity Location

The proposed Kanga-1 site survey will be conducted in an area measuring approximately 4 km x 4 km centred around the proposed Kanga-1 well location (operational area) (Table 1). The operational area is not located within any Marine Protected Areas.

The operational area is located approximately 163 km north-northwest of Karratha (Figure 1), in water depths of approximately 147 m.

Table 1: Proposed Operational Area

Latitude	Longitude
19° 20' 07.27" S	116° 20' 18.28" E
19° 17' 57.06" S	116° 20' 18.28" E
19° 17' 57.06" S	116° 22' 35.31" E
19° 20' 07.27" S	116° 22' 35.31" E

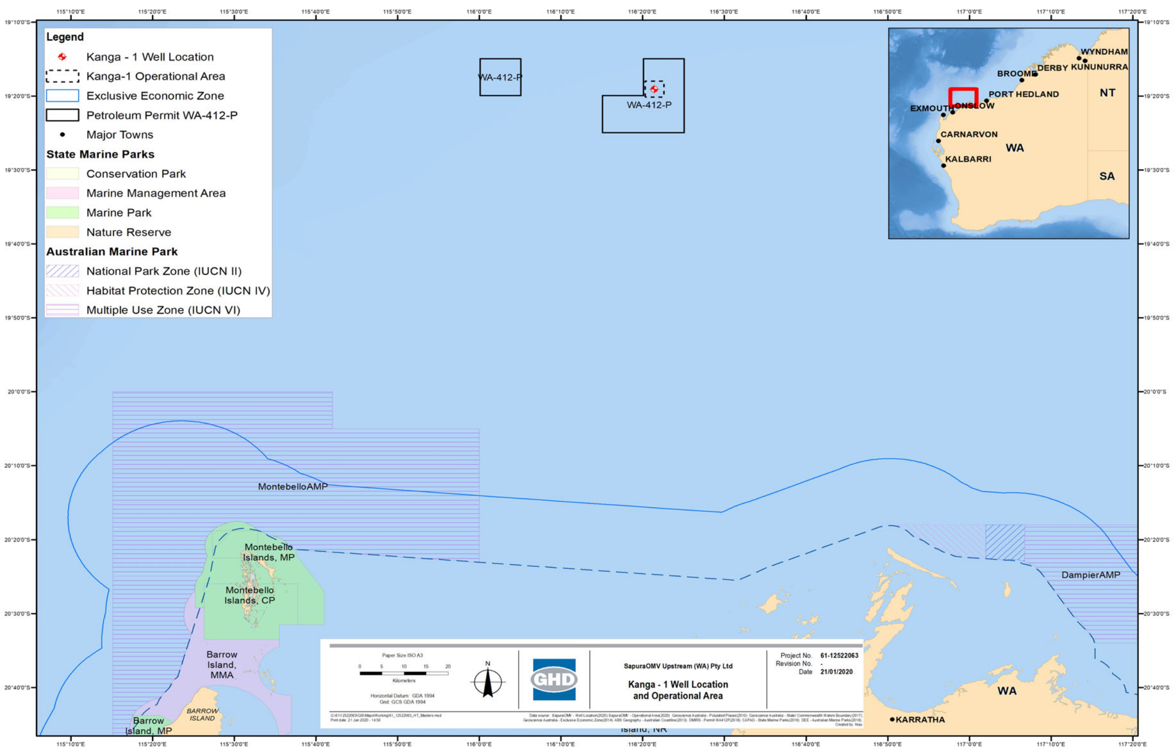


Figure 1: Location of Kanga-1 Site Survey Operational Area

SapuraOMV Upstream (WA) Pty Ltd

Level 2, 251 St Georges Terrace, Perth, 6000, Australia

T +618 6118 4990 | **Email** kanga.australia@sapura-omv.com | **www.sapura-omv.com**

Activity Duration

The site survey is expected to take up to 14 days (excluding weather and operational delays), and is planned to occur between October 2020 and November 2021.

Only one vessel is expected to be required onsite to complete the site survey studies, although a different vessel may undertake the different (e.g. geophysical vs geotechnical) activities. The vessel will operate on a 24-hour/day basis.

Survey Activity

Geophysical Study

The geophysical study will involve scanning the seabed to collect data (i.e. measurements of seabed characteristics, imaging and profiling) for assessment of water depths, seabed topography, seabed conditions and potential obstructions on the seabed. Proposed geophysical techniques include:

- Multi-beam echo sounder (MBES).
- Side scan sonar (SSS).
- Sub-bottom profiling (SBP).
- Magnetometer.

Geotechnical Study

The geotechnical study will collect seabed sediment samples and direct measurements of seabed conditions within the operational area. The purpose of the geotechnical survey is to assess seabed conditions within the operational area, including validating the geophysical survey measurements. Proposed techniques include:

- Piston or vibrocoring sampling.
- Cone Penetration Test (CPT).
- Box core sampling.

The site survey activities are standard industry practices involving established techniques and managed according to recognised standards and guidelines.

A summary of the potential impacts and risks identified for the site survey, and associated management measures for planned activities and unplanned events, are provided in Table 2.

Table 2: Summary of identified risks/ hazards and proposed management measures

Potential Risks / Hazards	Proposed Management and/or Mitigation Measures
Planned Events/ Hazards	
Physical presence: interaction with other marine users	• Relevant stakeholders will be notified prior to commencement of activities. • Maritime notices issued in advance of the site survey. • Vessel bridge-watch will be maintained 24 hours/ day to assist with early detection of approaching vessels.
Physical presence: seabed disturbance	• Deployment of submersible equipment will be carried out only under suitable weather/sea state conditions, as determined by the Vessel Master. • Recovery of anchors and equipment from the seabed upon completion of the activity. • Objects dropped overboard will be recovered (where possible).
Emissions: noise	• Noise emitting equipment will be maintained in accordance with Planned Maintenance System (PMS) to reduce risk of excessive noise due to poor maintenance. • Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with Cetaceans • Adopt measures consistent with the DPaW Whale Shark Management Program (2013), to avoid approaching closer than 30 m of a whale shark and not exceeding 8 knots within 250 m. • Vessel bridge-watch will be maintained 24 hours/ day to assist with early detection of marine megafauna. • Selection of techniques with lowest intensity sources that meets survey objectives (no seismic).
Emissions: light	• Lighting will be kept to a minimum while still meeting navigation and workplace safety requirements. • External lighting will be directed onto deck/working areas.
Emissions: atmospheric emissions	• Use of 'low sulphur' marine diesel, compliant with MARPOL/AMSA Marine Order. • Vessels will be compliant with MARPOL and legislative requirements. • Vessel engines and machinery/ equipment on-board maintained according to PMS.
Marine discharges: routine/ operational and domestic	• All routine marine discharges and waste treatment systems will be routinely managed and meet MARPOL and legislative requirements. • Engines/ machinery/ equipment on-board are certified and maintained in accordance with PMS.
Waste generation	• Wastes generated on-board vessels will be managed in accordance with legislative requirements and a Waste Management Plan. • Crew inductions will include requirements for waste management.

Potential Risks / Hazards	Proposed Management and/or Mitigation Measures
Unplanned Events/ Risks	
Introduction of invasive marine species (IMS)	• Survey vessel will be assessed and managed as appropriate to prevent the introduction of IMS. • Compliance with Australian biosecurity requirements and guidance. • Compliance with Australian Ballast Water Management Requirements (if appropriate).
Marine fauna interactions	• Implementation of EPBC Regulations (Part 8) for interacting with cetaceans to minimise disturbance to marine fauna caused by vessels and helicopter operations. • Adopt measures consistent with the DPaW Whale Shark Management Program (2013), to avoid approaching closer than 30 m of a whale shark and not exceeding 8 knots within 250 m. • Environmental awareness inductions will be provided to crew prior to the activities, including marine fauna interaction requirements and reporting arrangements.
Unplanned releases including hydrocarbons	• Survey vessel will have an approved Ship Oil Pollution Emergency Plan (SOPEP); spill response equipment and materials will be maintained and available on-board. • All personnel undertaking activities will undergo relevant inductions and training. • Procedures will be in place for equipment maintenance, inspections and bunding. • Site survey activities will be managed in accordance with vessel lifting and transfer procedures. • Emergency response capability will be maintained in accordance with the EP, which includes an Oil Pollution Emergency Plan (OPEP) in the event of a spill from an unlikely vessel collision incident.

Contact Details and Further Information

We welcome your response to understand how SapuraOMV's proposed activities may impact on your interests, together with any feedback on potential risks and impacts associated with the proposed activities.

We appreciate your input and any comments you may have for our consideration in the development of the EP. Should you wish to provide us with comments, please do so at your earliest convenience. Alternatively, if you would like to opt out of future communications, please let us know.

Email: kanga.australia@sapura-omv.com

Phone: 1800 959 553

Mail: SapuraOMV Upstream (WA) Pty Ltd
PO Box 7990
Cloisters, Western Australia, 6000

Appendix E – Oil Pollution Emergency Plan (OPEP)

SapuraOMV Upstream (WA) Pty Ltd

Kanga-1 Geophysical and Geotechnical Site Survey

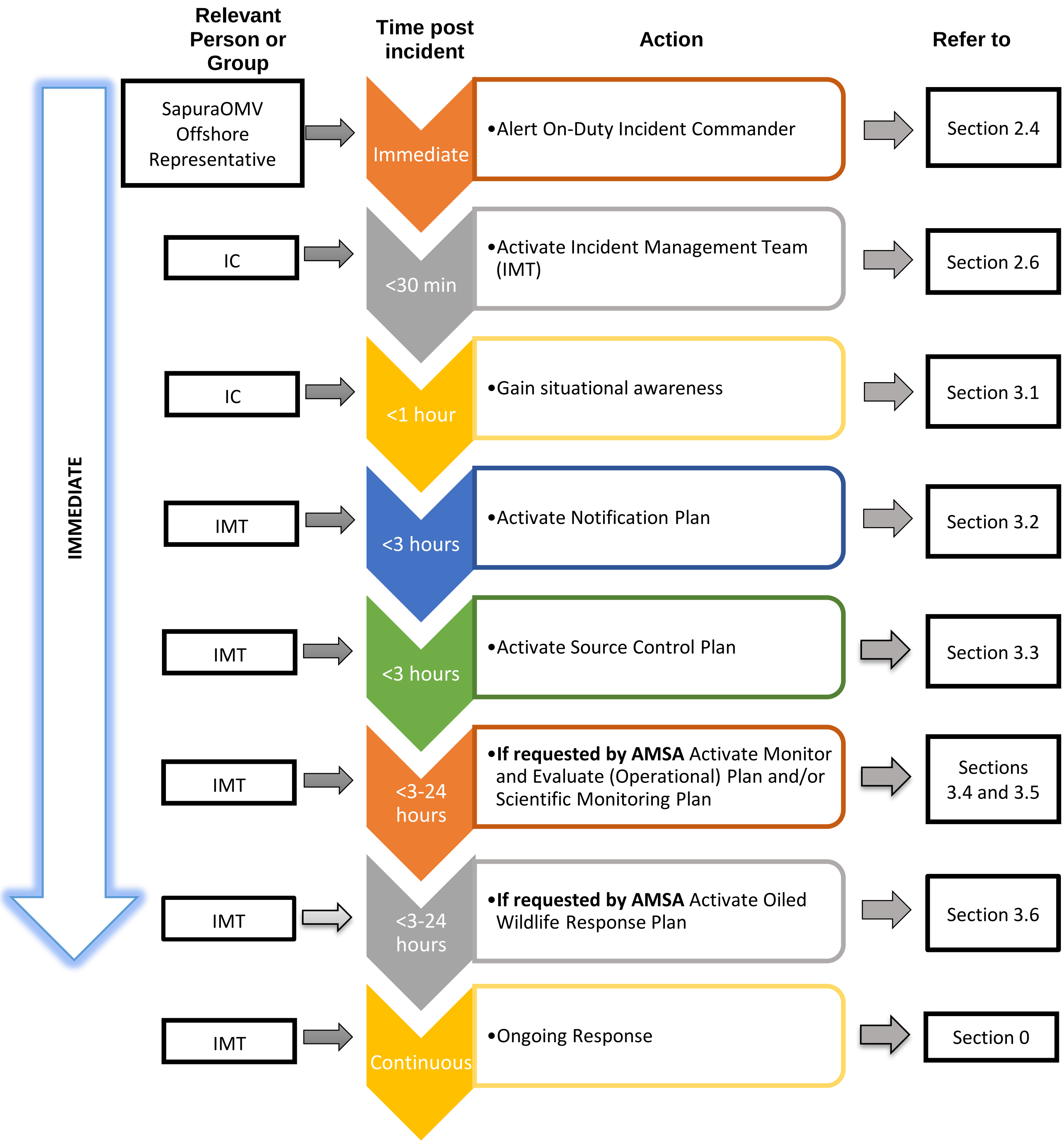
Oil Pollution Emergency Plan

May 2020

SapuraOMV Upstream (WA) Pty Ltd
Level 2, 251 St Georges Terrace
Perth, WA 6000
T: +61 8 6118 4990 www.sapura-omv.com
ACN 629 043 518

Quick Access Guide

In the event of a Level 2 spill initiate response in the following sequence:



DOCUMENT RECORD & MANAGEMENT

DOCUMENT INFORMATION

Document Title:	Kanga-1 Geophysical and Geotechnical Site Survey Oil Pollution Emergency Plan
Document Number:	AU-HSE-KG1-EX-PLN-034
Document Revision:	0
Document Owner:	HSE Department

CURRENT REVISION APPROVALS

Action	Name	Position	Initial	Date
Prepared by	GHD	-	JR	26 May 2020
Reviewed by	Michael Chua	Senior HSE Specialist		26 May 2020
Endorsed by	Richard Baillie	Drilling Manager		03 June 2020
Approved by	Zamin Zawawi	Country / Asset Manager		3 June 2020

REVISION / AMENDMENT RECORD

Rev	Date	Prepared	Reviewed	Endorsed	Approved	Description
A	29-Apr-19	GHD Pty Ltd	MC, RB, ZZ	-	-	Issued for review
0	25-May-19	GHD Pty Ltd	MC	RB	ZZ	Issued for submission to NOPSEMA

Table of Contents

Table Index

Figure Index

Appendices

LIST OF ACRONYMS

Abbreviation	Description
ppb	Parts per billion
ppm	Parts per million
km	Kilometre
m	Metre
m^3	Cubic metre
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre Pty Ltd
AMOSPlan	Australian Marine Oil Spill Plan
AMSA	Australian Maritime Safety Authority
APASA	Asia-Pacific Applied Science Associate
ASAP	As Soon As Possible
BAOAC	Bonn Agreement Oil Appearance Code
CMT	Crisis Management Team
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DMIRS	Western Australia Department of Mines, Industry Regulation and Safety
DoT	Western Australia Department of Transport
DPaW	Department of Parks and Wildlife (now DBCA)
EP	Environment Plan
EPBC	Environment Protection and Biodiversity Conservation
EPO	Environmental Performance Outcome
EPS	Environmental Performance Standard
ERT	Emergency Response Team
ESC	Environmental Scientific Coordinator
G&G	Geophysical and Geotechnical
GPS	Global Positioning System
HMA	Hazard Management Agency
HSE	Health, Safety and Environment
HSEMS	Health, Safety and Environment Management System
IC	Incident Commander
IAP	Incident Action Plan
IMP	Incident Management Plan
IMT	Incident Management Team
IPIECA	International Petroleum Industry Environmental Conservation Authority
JRCC	Joint Rescue Coordination Centre - Australia
MDO	Marine Diesel Oil
MEE	Maritime Environmental Emergencies
MEECC	Maritime Environmental Emergency Coordination Centre
MEER	Maritime Environmental Emergency Response
MGO	Marine Gas Oil
MoC	Management of Change
MoU	Memorandum of Understanding
NatPlan	National Plan for Maritime Environmental Emergencies
NEBA	Net Environmental Benefit Analysis
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NRT	National Response Team
NWS	North West Shelf
OPEP	Oil Pollution Emergency Plan
OPGGS	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSMF	Operational and Scientific Monitoring Framework

Abbreviation	Description
OSMIP	Operational and Scientific Monitoring Implementation Plan
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling
OWA	Oiled Wildlife Advisor
OWD	Oiled Wildlife Division
OWR	Oiled Wildlife Response
PPE	Personal Protective Equipment
PROWRP	Pilbara Region Oiled Wildlife Response Plan
RCC	Rescue Coordination Centre
SAG	Scientific Advisory Group
SapuraOMV	SapuraOMV Upstream (Western Australia) Pty Ltd
SAP	Sampling and Analysis Plan
SAT	Shoreline Assessment Team
SCT	Site Control Team
SITREP	Marine Pollution Situation Report
SMEEC	State Maritime Environmental Emergency Coordinator
SOPEP	Shipboard Oil Pollution Emergency Plan
SRT	State Response Team
WA	Western Australia
WAOWRP	Western Australian Oiled Wildlife Response Plan
WDC	Wildlife Division Coordinator

1. Introduction

1.1 Purpose

This Oil Pollution Emergency Plan (OPEP) accompanies the *Kanga-1 Geophysical and Geotechnical Site Survey Environment Plan (AU-HSE-KG1-EX-PLN-033)* (EP), as required by Regulation 14(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R). This OPEP describes the offshore oil spill response arrangements to be undertaken for an oil spill incident arising from the Kanga-1 Geophysical and Geotechnical Site Survey (the Activity). This OPEP is to be read in conjunction with the EP when considering the existing environment, environmental impacts, risk management, performance standards, reporting compliance, and the decision processes that will apply in the event that a spill occurs. It contains the necessary information to carry out a response during an emergency marine oil pollution incident arising from the Activity and is consistent with the National Plan for Maritime Environmental Emergencies (NatPlan).

In accordance with MARPOL Annex I, all vessels greater than 400 gross tonnage are required to carry a Shipboard Oil Pollution Emergency Plan (SOPEP). SOPEPs are the principal operational plans for crew in the event of a spill from a vessel.

1.2 Summary of Proposed Activity

SapuraOMV Upstream (Western Australia) Pty Ltd (SapuraOMV) is the registered titleholder and operator for petroleum exploration permit WA-412-P in offshore Commonwealth waters on the North West Shelf (NWS) of Western Australia (WA). SapuraOMV propose to carry out the Activity to assess the seabed condition and geology of the shallow subsurface, and identify any hazards (seabed features) between January 2021 and November 2021. The Activity may take up to 14 days within a 4 km by 4 km area (the Operational Area) in ~147 m water depth (**Figure 1-1**). The Operational Area is ~165 km north of Karratha and ~125 km north of Legendre Island (nearest land).

1.3 Overview of Potential Spill Impacts

The EP evaluated the following two potential oil spill scenarios (**EP Sections 8.1 and 8.2**):

- A **Level 1 spill** (<10 m^3) that can be resolved with existing onsite resources, equipment and personnel. Level 1 oil spills are expected to spread rapidly on the sea surface (e.g. small hydrocarbon spill) or disperse rapidly in the water column (e.g. ROV hydraulic hose spill) (refer to **EP Section 8.2**). These small releases would be managed with the vessel's SOPEP and spill kits/equipment.
- **A Level 2 spill** of marine diesel oil (MDO) or marine gas oil (MGO) from a vessel collision scenario (up to 200 m^3) is described in **EP Section 7.1**. As MDO has greater persistence in the marine environment than MGO, it provides a more conservative indication of the areas that may be exposed to hydrocarbons in the event of such a spill. Due to the relatively large distance offshore from any proximal land, shoreline loading is not predicted with surface and submerged oil concentrations above impact thresholds within ~147 km of the Operational Area. Predicted impacts from a Level 2 MDO spill from a vessel collision scenario are described in **EP Section 8.2** on the basis of GHD (2020) oil spill modelling.

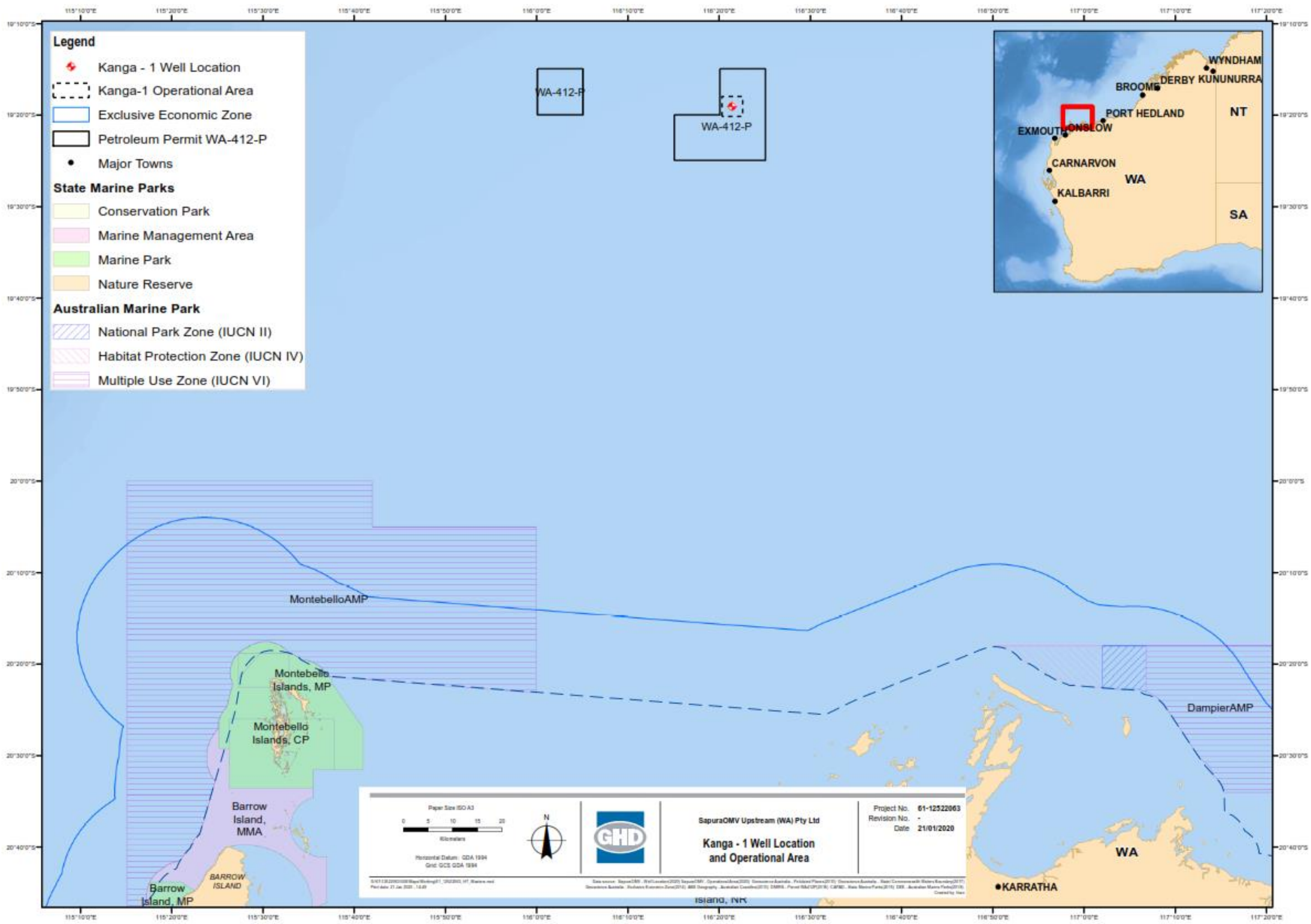


Figure 1-1 Location of operational area

1.4 Selected Spill Response Strategies

1.4.1 Level 1 Spills

Level 1 spills (<10 m^3) can be resolved with existing onsite resources, equipment and personnel. Level 1 oil spills into the marine environment from accidental releases during operational tasks (e.g. handling error, hose rupture) are expected to spread rapidly on the sea surface (**EP Section 8.2**). These small releases are not addressed in this OPEP, but would be managed in accordance with the SOPEP along with onboard spill kits/equipment. Examples of response actions for these Level 1 spills include:

- Stop the leak (e.g. turning off pumps/machinery).
- Contain any spilled hydrocarbons on the vessel (e.g. in a bunded area).
- Clean-up the spill with onboard spill kits.
- Bagging and safe storage of clean-up materials for subsequent onshore disposal at a suitable waste facility.

1.4.2 Level 2 Spills

A preliminary net environmental benefit analysis (NEBA) was used to select response strategies in the event of a Level 2 spill (**Appendix A**). During a Level 2 spill, operational NEBAs will be undertaken by the IMT during the Incident Action Plan (IAP) development process (**Section 4**), so spill response strategies and their implementation may evolve over time. The ‘As Low As

Reasonably Practicable' (ALARP) principle was used to select control measures to implement for each of the spill response strategies (**Appendix A**). A summary of the selected response strategies and control measures for a Level 2 spill in this OPEP are provided in **Table 1-1**.

Table 1-1 Selected primary and secondary response strategies for a Level 2 spill

Response Strategy	Level 2	Control Measure or Justification for Not Selected
Source Control – Vessel Spill	Primary	SOPEP.
		Vessel-based spill clean-up equipment.
Monitor and Evaluate (Operational Monitoring)	Primary	Manage by IAP and OSMP.
		Oil Spill Trajectory Modelling.
		Spill surveillance via oil spill tracking buoys, aerial and/or vessel observations, shoreline assessment and/or satellite imagery.
In situ Burning	No	Not applicable due to insufficient oil thickness and time to mobilise.
Surface Dispersant Application – Vessel	No	Not applicable due to insufficient oil thickness and time to mobilise.
Surface Dispersant Application – Aerial	No	
Mechanical Dispersion	No	Not applicable as no predicted oil pollution of sensitive shorelines, and intertidal or shallow subtidal receptors.
Containment & Recovery	No	Not applicable due to insufficient oil thickness and time to mobilise.
Shoreline Protection & Deflection	No	No predicted shoreline exposure.
Shoreline Clean-up	No	No predicted shoreline exposure.
Oiled Wildlife Response	Secondary	AMOSC agreements.
		AMOSC equipment availability.
Scientific Monitoring	Primary	Managed by IMT during response, scientific monitoring contractor thereafter.
		Call-off arrangements with service providers.

1.5 Prioritisation of Sensitive Locations

For spill response planning purposes, on the basis of oil spill modelling (GHD, 2020) and the environmental risk of a Level 2 MDO spill (**EP Section 8.2**), no protection priority sites were identified in the EP. During a Level 2 spill protection priorities may be identified on the basis of the nature and scale of the event.

1.6 Integration with Other SapuraOMV and Contractor Plans

This OPEP interfaces with other SapuraOMV and contractor plans as described in **Table 1-2**.

Table 1-2 Crisis and emergency management plans

Title	Document Number	Scope and Function
SapuraOMV Health, Safety and Environment Management System (HSEMS)	HSE-MM-MAN-0001	SapuraOMV HSEMS expectations to achieve Operating Excellence with respect to health, safety and environmental management.

Title	Document Number	Scope and Function
SapuraOMV Incident Management Plan (IMP)	AU-HS-PLN-002-1.0	IMT response procedures for the safe, rapid, effective and efficient management of incidents in Australia.
SapuraOMV Kanga-1 Geophysical and Geotechnical Site Survey EP	AU-HSE-KG1-EX-PLN-033	Environmental management requirements for the this geophysical and geotechnical site survey activity
Vessel SOPEP	As per contractor document control.	SOPEP as per MARPOL requirements.

1.6.1 SOPEP

Under MARPOL Annex I requirements, all vessels >400 gross tonnage are required to have a current SOPEP. The SOPEP is the principal working document for vessel and crew in the event of a marine oil spill. It provides specific management response provisions to mitigate and combat oil spills originating from vessels including:

- Actions by the Vessel Master to report an oil spill incident, including the list of authorities to be contacted and the details on the spill that needs to be provided.
- Actions by crew onboard in the event of an oil spill including steps taken to contain the source with equipment available on the vessel.
- Roles and responsibilities of all personnel onboard during a oil spill incident.
- Procedures and point of contact on the ship for coordinating shipboard activities with National and Local Authorities.
- Details of spill equipment onboard the vessel.
- Vessel drawings (drainage and layout).
- Testing and drill requirements.
- Emergency procedures to control discharges for bunkering spills, hull damage, grounding and stranding, fire and explosion, collision, tank failure, sinking and vapour release.

1.7 Organisational Roles and Responsibilities

The roles and responsibilities of organisations referred to in this OPEP are provided in this section.

1.7.1 Jurisdictional Authority

The Jurisdictional Authority is the relevant Statutory Authority identified in NatPlan that has the jurisdictional or legislative responsibilities for oil pollution to ensure there is adequate prevention of, preparedness for, response to and/or recovery from a specific incident.

1.7.2 Controlling Agency

The Controlling Agency is the agency or organisation assigned by legislation, administrative arrangement or within the Oil Pollution Emergency Plan (OPEP) to control the response activities of an actual or impending oil spill incident.

1.7.3 SapuraOMV Upstream (WA) Pty Ltd

As required by Regulation 14(8) of the OPGGS(E)R, SapuraOMV is required to include an OPEP to accompany the EP that includes preparedness for the possiblity of an oil spill, and emergency response arrangements to be implemented if an oil spill occurs. The EP includes control measures to ensure the implementation of SapuraOMV's oil spill response responsibilities. As per SapuraOMV's Incident Management Plan (AU-HS-PLN-002-1.0), SapuraOMV's Incident Commander (IC) would be notified in the event of a spill incident and SapuraOMV's Incident Management Team (IMT) would be activated if required by the IC.

1.7.4 Vessel Master

In the event of a spill from/on the survey vessel, the Vessel Master will take on the role of On Scene Commander (OSC). The OSC will be responsible for the implementation of emergency response procedures as per the SOPEP and the onsite requirements of this OPEP. This includes first response measures under the SOPEP with resources immediately available to the vessel.

1.8 Jurisdictional Authorities and Controlling Agencies

For vessel-based oil spills the Jurisdictional Authority and Controlling Agency is the Australian Maritime Safety Authority (AMSA) for Commonwealth waters and the WA Department of Transport (DoT) for State waters (**Table 1-3**).

Table 1-3 Jurisdictional authority and controlling agency for oil spills in Commonwealth and State waters for this Activity

Location	Incident	Jurisdictional Authority	Controlling Agency	
			Level 1 Spill	Level 2 Spill
Australian Commonwealth waters	Vessel Spill	AMSA	AMSA	AMSA
WA State waters	Vessel Spill	DoT	DoT	DoT

1.8.1 Commonwealth Waters

For all vessel spill incidents in Commonwealth waters, AMSA is both Jurisdictional Authority and Controlling Agency. AMSA manages the NatPlan, Australia's key maritime emergency contingency and response plan. For any vessel-based large oil spill incident, the Vessel Master will notify AMSA immediately to facilitate the most efficient and effective response.

SapuraOMV will make contact with AMSA post the initial notification to render support in a Supporting Agency capacity if required.

1.8.2 Cross-Jurisdictional Spills

Cross-jurisdiction relates to a marine oil pollution incident that originates in Commonwealth waters and moves into State waters, resulting in the DoT exercising their Hazard Management Agency (HMA) obligations in respect to actual or impending response activities in State waters. For this Activity, in the event of a Level 2 vessel spill that originates in Commonwealth waters and moves into State waters, AMSA and the DoT will assume the role of Controlling Agencies in Commonwealth and State waters, respectively. SapuraOMV will provide necessary resources (personnel, equipment or services) as directed by AMSA and/or DoT. In all instances, SapuraOMV will be responsible for covering all cost associated with an oil spill response.

Oil spill trajectory and fate modelling of the worst-case spill scenario (200 m^3 of marine diesel oil) predicts that a spill in the Operational Area within Commonwealth waters will not lead to any shoreline loading (**EP Section 8.2**, GHD (20202)). Hence, it is unlikely that cross-jurisdictional arrangements will apply in the event of a Level 2 spill for this Activity as oil pollution of State waters in highly unlikely.

2. Crisis and Incident Management Response

2.1 Overview of Crisis and Incident Management System

Crisis and incident response is managed by a hierarchy of teams within SapuraOMV supported by the resources of SapuraOMV's office in Kuala Lumpur. Response teams are progressively activiated depending on the level of incident severity, resource needs, and incident complexity. Responsibility begins at the site level Contractor Emergency Response Team (ERT) or Site Control Team (SCT) and rises through the Incident Management Team (IMT) in Perth and the Crisis Management Team (CMT) in Kuala Lumpur (see **Figure 2-1**).

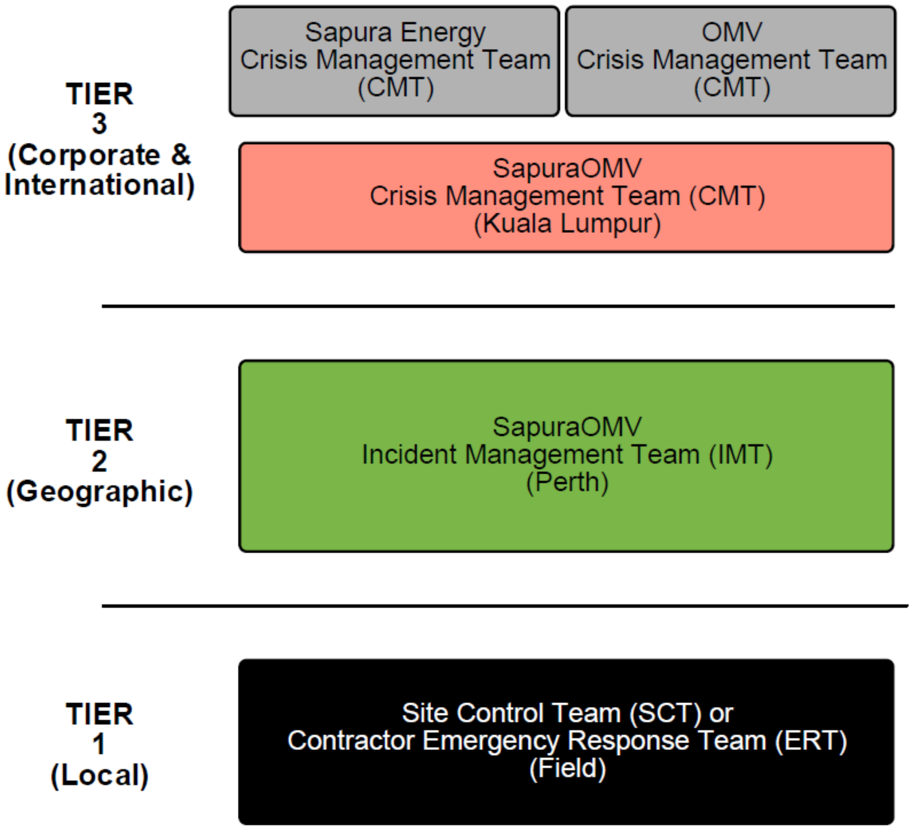


Figure 2-1 Crisis and incident management structure

2.2 Responsibilities of Crisis and Incident Management Teams

A high level overview of the responsibilities of the ERT/ SCT, core IMT sections and CMT is provided in **Table 2-1**.

Table 2-1 Strategic responsibilities of ERT/ SCT, core IMT sections and CMT

Personnel/ Teams	Responsibilities
ERT/ SCT	• Initiates the OPEP (and SOPEP) response to a Level 2 spill; • Onsite management of the spill response, especially during the early stages; • Notify and communicate directly with the IMT; and • Site-based employee safety and welfare issues.

Personnel/ Teams	Responsibilities
IMT	Incident Commander (IC) The IC leads the IMT and is responsible for the overall management and support to the response operations of the incident. Planning Section • Conduct short-term (e.g. preparation of Incident Action Plans [IAPs]) and long-term planning (e.g. preparation of a General Plan) to meet Strategic Objectives of the response as set by Command Section. • Manage information associated with emergency response operations by establishing and maintaining a situation status display (the Information Centre) and collecting and preserving documentation. • Environmental Unit provides advice, monitoring and technical support and will include a 3rd party specialist to assist with implementation of the OSMP for operational and scientific monitoring. Operations Section • Provide strategic direction to the ERT. • Incorporates any mobilised specialist technical capability to support the response. This technical knowledge may include (but not limited to) environmental, oil spill response and trajectory analysis expertise. • Direct assessment and planning for spill response actions. • Development of spill response section of the IAP. • Management, supervision and monitoring of spill response operations. • Responsible for informing IMT on nature and status of spill response operations. Logistics Section • Support emergency response operations by sourcing personnel, equipment, materials, and supplies needed to carry out the operations. • Coordinate the services to sustain emergency response including food, water, housing, clothing, transportation, first aid, security, fuel, spare parts and anything else to keep people and equipment working in a safe and productive fashion. Finance and Administration Section • Manage all financial aspects of the response ensuring that the IMT has the necessary financial resources and processes in place. • Monitor expenditure and maintains records for insurance / cost recovery purposes.
CMT	Addresses the implications of the problem and its potential impacts on the Company's viability, operability and credibility.

2.3 IMT Functional Role and Structure

The IMT is accountable for managing the overall physical and tactical response. The IMT also manages all other issues arising from an emergency that have implications to SapuraOMV personnel or operations throughout Australia. The functional role of the IMT is to:

- Establish and maintain contact and provide guidance and support to the On Scene Commander (Vessel Master), who is conducting the physical and immediate response to the incident at and near the incident scene.
- Develop objectives and associated plans for the overall management of the incident and its consequences, ensuring the response moves from a reactive to a proactive response as quickly as possible.
- Obtain and mobilise resources as appropriate to support the operations of the IMT and support staff.
- Ensure that initial notifications and interactions with Commonwealth, State and Local Government regulatory bodies are completed.

- Manage relationship with traditional and social media, including issuing media statements.
- Manage all immediate financial matters related to the incident including implementing procurement and cost tracking processes.
- Escalate the stakeholder impacts and broader emergency management concerns and requests for support to the CMT in Kuala Lumpur (if activated but not likely for a Level 2 incident).

The IMT is organised in accordance with the principles of the International Petroleum Industry Environmental Conservation Authority (IPIECA) Good Practice Guidelines – Incident Management System. SapuraOMV's IMT structure is illustrated in **Figure 2-2**.

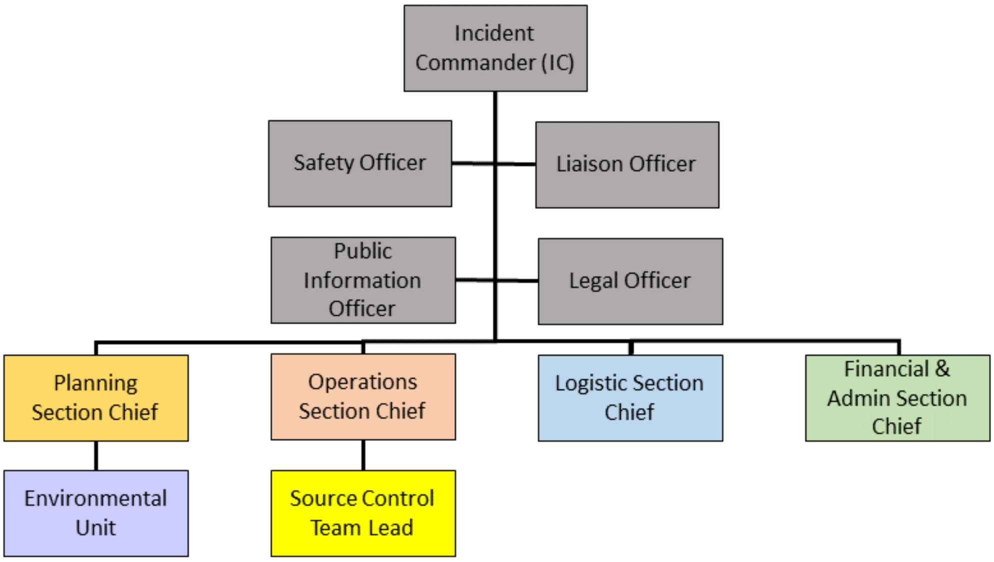


Figure 2-2 IMT structure

2.4 Internal Emergency Response Activation Process

In the event of a Level 2 spill, the SapuraOMV Offshore representative is to contact the On-Duty Incident Commander at +61 8 6118 0530. **Figure 2-3** shows SapuraOMV's internal emergency response activation process in the event of a large (Level 2) hydrocarbon spill. Contact numbers for personnel in **Figure 2-3** are listed in SapuraOMV's Emergency Contact List in Annex 1 of the Incident Management Plan (AU-HS-PLN-002-1.0). This list is regularly updated and distributed to all relevant parties.

Response to Level 1 spills is according to the vessel's SOPEP.

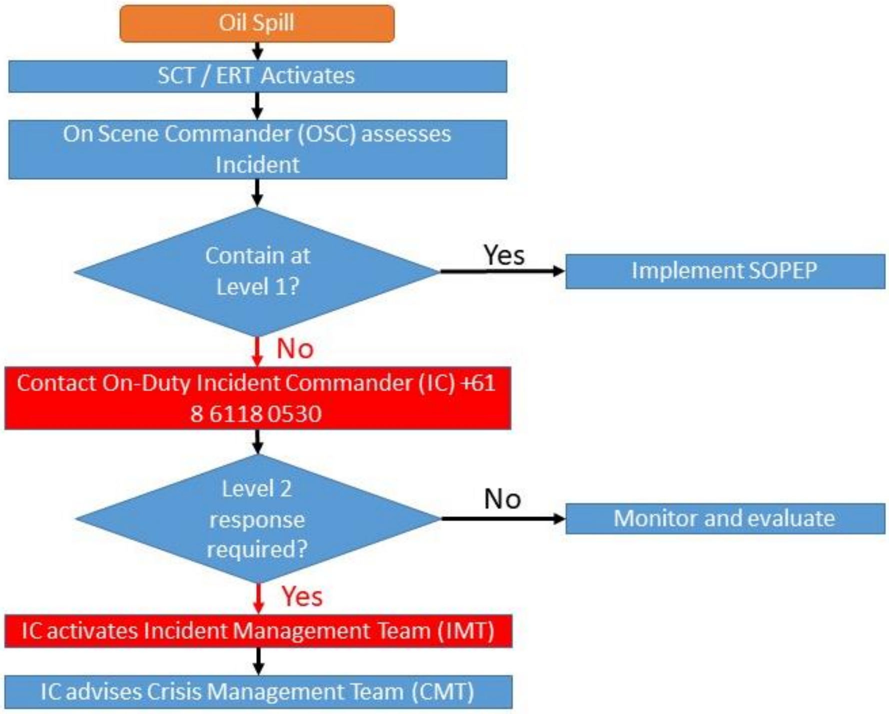


Figure 2-3 Internal emergency response activation process

The responsibilities of those involved in emergency response notification procedures relevant to a Level 2 spill are detailed in **Table 2-2.**

Table 2-2 SapuraOMV and contractor roles and responsibilities during emergency response activation

Role	Position	Location	Responsibility
SapuraOMV Personnel			
SapuraOMV Offshore Representative(s)	SapuraOMV Offshore Representative	Survey Vessel	• Responsible for emergency communications with the SapuraOMV IMT.
Incident Commander (IC)	On-Duty SapuraOMV Management of IMT	Perth	• Ensure adequate structure of the IMT for response escalation if required. • Liaison between Statutory Authorities, Controlling Agencies, Response Agencies and other stakeholders. • Inform SapuraOMV CMT.
Contractor Personnel			
On Scene Commander (OSC)	Vessel Master	Survey Vessel	• Responsible for emergency communications with AMSA. • Responsible for implementation of emergency response procedures.
Third Party Contractors	Various	Vessels / Aircraft	• Follow instruction from the IC and IMT.

2.5 Communication and Integration with Other Organisations and Plans

2.5.1 Australian Maritime Safety Authority (AMSA) and National Plan for Maritime Environmental Emergencies (NatPlan)

NatPlan sets out national arrangements, policies, and roles and responsibilities of states, territories and industry, in managing maritime environmental emergencies. NatPlan integrates Commonwealth and State government oil spill response frameworks to facilitate effective response to marine pollution incidents. The Australian Maritime Safety Authority (AMSA) manages NatPlan and works with State governments (who manage the equivalent State plans that integrate into the NatPlan), shipping, petroleum, chemical industry and emergency services to optimise Australia's marine pollution response capability. This plan applies to all hydrocarbon spills in Commonwealth waters seaward of the State water limit while the WA State Hazard Plan – MEE applies in State waters within 3 nautical miles (nm) of the territorial sea baseline.

For a Level 2 spill incident the Vessel Master (or delegate) will notify AMSA immediately in the interest of facilitating the most efficient and effective response. Upon notification of an incident involving a ship, AMSA will assume control of the incident and respond in accordance with NatPlan.

2.5.2 Australian Marine Oil Spill Centre (AMOSC) and AMOSPlan

SapuraOMV will has access to AMOSC oil spill recovery and response equipment, dispersant and technical (human) capabilities along with those resources held by member companies as outlined in the AMOSPlan on a 24-hour, 7-days a week basis before and throughout the site survey operations. SapuraOMV's primary interface with the AMOSPlan during an oil spill response is via AMOSC's 24/7 Duty Officer, who will provide the initial point of contact for oil spill responses that require AMOSC assistance.

AMOSC is a member of the Global Response Network.

2.5.3 WA Department of Transport (DoT) and WA State Hazard Plan – Maritime Environmental Emergencies (WA State Hazard Plan – MEE)

The WA State Hazard Plan - MEE sets out arrangements for managing marine oil pollution and marine transport emergencies in WA. The WA State Hazard Plan – MEE prescribes management arrangements for the prevention of, preparation for, response to and recovery from a marine oil pollution incident in order to minimise the impacts of an oil spill incident from vessels, offshore petroleum activities and other sources in State waters.

Where a Level 2 spill enters or is predicted to enter State waters, the HMA (DoT Marine Safety General Manager, or their designated proxy) will assume the role as the State Maritime Enviornmental Emergency Coordinator (SMEEC), and the DoT will take on the role of Controlling Agency for response actions in State waters. The HMA has overall responsibility for ensuring there is an adequate response to spill incidents in State waters, including those from a spill originating in Commonwealth waters. The SMEEC provides overall strategic management response and executive level support and guidance to the Incident Controller.

For any Level 2 spill that crosses from Commonwealth to State waters, it is an expectation that SapuraOMV will conduct initial response actions in State waters as necessary in accordance with this OPEP and continue to manage those operations until formal incident control can be established by DoT. SapuraOMV will notify the DoT Maritime Environmental Emergency Response (MEER) unit as soon as reasonably practicable as per the **Section 3.2** Notification

Plan. Upon notification the HMA will establish and operate the Maritime Environmental Emergency Coordination Centre (MEECC) and activate the DoT IMT.

SapuraOMV will provide appropriately qualified personnel to assist with field operational activities, such as oiled wildlife response. DoT may also opt to deploy field response personnel through the State Response Team and request National Response Team support.

2.5.4 WA Department of Biodiversity, Conservation and Attractions (DBCA) and WA Oiled Wildlife Response Plan (WAOWRP)

The DBCA has responsibility and statutory authority to protect wildllife (fauna) as outlined in the WA *Biodiversity Conservation Act 2016* . It also has leglislative requirement to ensure the humane treatment, housing and release or euthanising of fauna under the *Animal Welfare Act 2002*.

For spills in State waters, DoT is the Controlling Agency and DBCA is the Jurisidictional Authority and lead agency for oiled wildlife response (OWR). The role of DBCA in OWR is outlined in Western Australia Oilded Wildlife Response Plan (WAOWRP) (DPaW, 2014a) and regional sub-plans. The WAOWRP sets out the minimum standard required for OWR in WA in both State and Commonwealth waters. The Plilbara Region Oiled Wildlife Response Plan (PROWRP) (DPaW, 2014b) outlines specific 'on ground' information required to carry out OWR specific to this region (e.g. environmental values, high risk environmental areas, designated oiled wildlife facilities, equipment lists and resource lists, contact lists).

For a Level 2 spill originating from a vessel incident in Commonwealth waters that move into State waters, SapuraOMV will retain command until formal incident control is etablished by WA DoT. In the event that wildlife has been impacted or there is imminent threat of impact requiring OWR, the WAOWRP and PROWRP will be activated. A Wildlife Division Coordinator (WDC) will be established and will liaise with the DoT to identify and coordinate the necessary OWR functional units of the Oiled Wildlife Division (OWD), as per the WAOWRP. In the event of oiled wildlife, DBCA will provide an Oiled Wildlife Advisor (OWA). The OWA and WDC will provide advice to the DoT on the level of OWR required and will ensure provision of resources to support OWR operations.

If DoT becomes the Controlling Agency in State waters, they will be responsible for overall control of OWR in State waters. SapuraOMV will provide necessary resource (equipment and personnel, primarily through SapuraOMV's AMOSC membership), as directed by DoT to support their functions.

For a Level 2 spill impacting only Commonwealth waters, DBCA will similarly provide advice on OWR to the SapuraOMV IMT through a nominated OWA.

2.6 IMT Activation

The activation of the SapuraOMV incident management response is on the basis of the Level of a spill, where for a:

- Level 1 spill the Vessel Master is in control of the response. The IC will be advised/informed, but the IMT will not normally require activation.
- Level 2 spill the IMT is activated and will typically take control of the response. The CMT will notrequire activation but will be informed by the IC.

As described previously in **Section 2.4** (Internal Emergency Response Activation Procedure), contact numbers of IMT personnel are listed in SapuraOMV's Emergency Contact List per Annex 1 of the Incident Management Plan (AU-HS-PLN-002-1.0), which is regularly updated and distributed to all relevant parties. Also refer to the Notification Plan in **Section 3.2**.

A range of mutual support agencies may be invited to the IMT at the start of a Level 2 incident. The WA DoT will attend if the spill crosses or is predicted to cross inton State waters as described in **Section 2.5.3**. Refer to the Notification Plan in **Section 3.2** for the internal and external notification procedure in the event of a Level 2 spill incident.

3. Immediate Actions

Immediate actions after a Level 2 spill are described in this section to expedite spill response by the IMT. These actions are to be undertaken while the Incident Action Plan (IAP) is updated during the subsequent 'Ongoing Response' (**Section 4)**. Immediate actions to be executed by the IMT include:

- Gain situational awareness of the incident (**Section 3.1**).
- Execute the Notification Plan (**Section 3.2**).
- Support the Source Control Plan (**Section 3.3**).
- If requested by AMSA, provide support for hydrocarbon surveillance and tracking (**Section 3.4**).
- If requested by AMSA, initiate the Scientific Monitoring Plan (**Section 3.5**).
- If requested by AMSA, provide support for OWR (**Section 3.6**).

3.1 Incident Situational Awareness

3.1.1 Information Acquisition

The IMT must initially gain situational awareness by obtaining onsite information immediately after activation. Responsibility for collection of onsite information of a Level 2 spill will reside with the Vessel Master. At a minimum the following questions need answers:

- What caused the spill?
- What type of oil has been spilled?
- How much oil has been spilled?
- Is the spill source under control?
- What is the spill's trajectory?
- Is there anything in the path of the predicted spill trajectory?
- Can the spill be contained?
- What are the winds and sea state conditions?

3.1.2 Classification of Spill Level

Following information acquisition (**Section 3.1.1**), the spill level will be classified via **Table 3-1** to gauge a proportionate response. Where doubt exists over the severity or appropriate response to spill event, the On Scene Commander (Vessel Master) is to discuss the situation with the IC. **The principle of prudent over-reaction and rapid de-escalation applies when considering the level of activation as it is easier and usually more effective to scale down an over-reaction than to ramp up an under-reaction.**

Table 3-1 Guideline to determine spill level and spill response

Level 1 Spills	
Small spills (as a guide only – spills up to 10 tonnes) (0 - 70 bbl or 0 -10 m^3)	
Possible Scenario	Spill from handling error (e.g. dropped object) or containment failure (e.g. leaking/ hose rupture).
Worst Case Credible Volume	Volume up to 10 m^3
Resourcing Requirements	As described in SOPEP
Description	• Incident can be controlled with onsite resources (immediate response and containment). • Any spill into marine waters rapidly dissipates. • Low danger of explosive vapours. • No potential impact to environmental sensitive areas and/or local communities. • Unlikely any media interest.
Level 2 Spills	
Spills between 10 and 1,000 tonnes (>70-7,000 bbl or >10-1,000 m^3)	
Possible Scenario	Hydrocarbon spill due to vessel collision releasing contents of single diesel fuel tank.
Worst Case Credible Volume	Volume of single MDO/MGO fuel tank (up to 200 m^3)
Resourcing Requirements	As described in SOPEP, AMOSPlan and NatPlan and possibly, if the spill enters State waters, WA State Hazard Plan-MEE, WAOWRP and PROWRP.
Description	• Incident cannot be controlled solely by use of onsite resources and requires additional support and resources to manage the spill. • Risk of fire or explosion. • Potential for additional release. • Potential impact to environmental sensitive areas and/ or local communities. • Spill extends beyond spill source site. • Local / national media attention.

3.2 Notification Plan

Figure 3-1 shows the SapuraOMV notification procedure in the event of a Level 2 spill. The On Scene Commander (Vessel Master) is responsible for activating the initial onsite response for all spills. The IC (or delegate) is responsible for subsequent activations and notifications on the basis of the spill circumstances. Notifications will include:

- Information and circumstances regarding the incident.
- Actions taken to avoid or mitigate any adverse environmental impacts.
- Any corrective actions that have been taken (or proposed) to prevent a similar incident.

The environmental performance outcome, performance standard and measurement criteria for the Notification Plan are provided in **Table 3-2**. Key SapuraOMV roles, and regulator and spill response organisations contact details are provided in **Table 3-3**.

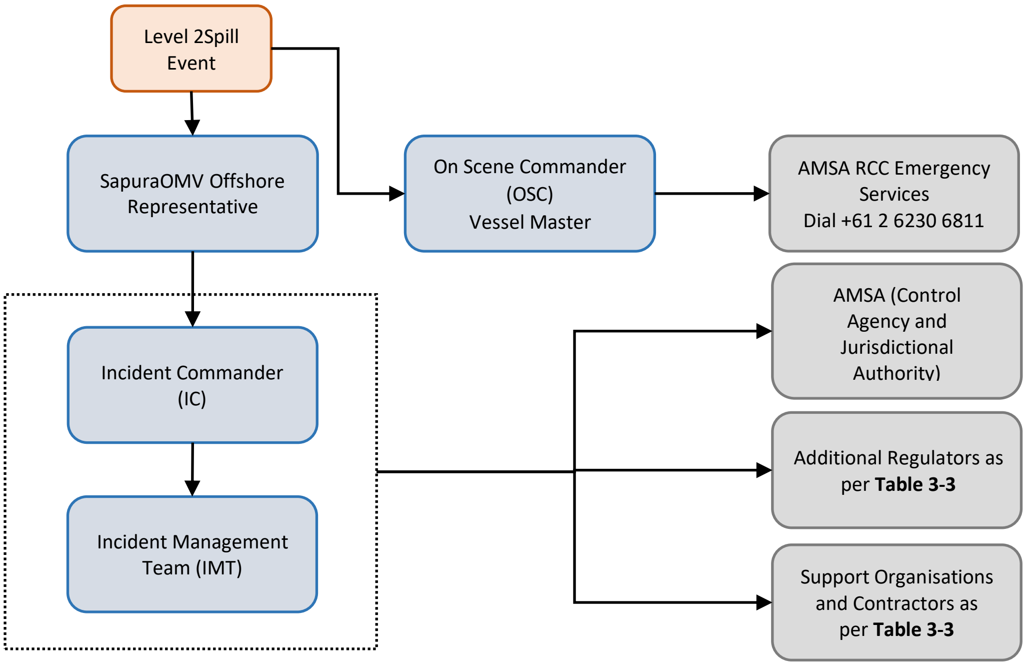


Figure 3-1 Summary of internal and external spill notification procedure

Table 3-2 Performance criteria for spill notifications

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Environmental agencies are informed of the incident and the response arrangements within regulatory stipulated timeframes.	Undertake communications in accordance with the Notification Plan.	• Communications records. • Incident log. • Applicable notifications within nominated timeframes.

Table 3-3 Notification plan contact details

From	To	Description	Type	Timing
Level 1 and Level 2 Spills				
Vessel Master	SapuraOMV Offshore Representative	Notify of incident and provide situational awareness information and updates.	Verbal	ASAP and no later than 15 minutes of incident.
	AMSA (Rescue Coordination Centre) +1 800 641 792 (24 hrs, in Australia) + 61 2 6230 6811 (24 hrs, outside of Australia) *Do not use this number when testing notification plan.*	Legal requirement to notify in the event of any spill of oil to sea. Notification and request for mobilisation of NatPlan resources. Jurisdictional Authority and Controlling Agency for all spills from vessels in Commonwealth waters.	Verbal.	ASAP and no later than 30 minutes of incident.
			POLREP (i.e. pollution report) (https://amsa-forms.nogginoca.com/public/polrep.html).	As soon as practicable, but no later than 1 day of incident. Copy to SapuraOMV IC
	Emergency Services Dial 000 or 112 (satellite phone) *Refer: https://www.amsa.gov.au/vessels-operators/incident-reporting#collapseArea382*	Request relevant local emergency services for any health and safety issues.	Verbal	ASAP and no later than 1 hour of incident.
SapuraOMV Offshore Representative	On-duty Incident Commander (IC) +61 8 6118 0530	Notify of incident and provide preliminary situational awareness info.	Verbal.	ASAP or within 1 hour of incident.
IC (or delegate) (Level 2) or Sapura OMV Lead Engineer (Level 1)	NOPSEMA (if reportable incident) +1 300 674 472 submissions@nopsema.gov.au	Requirement to notify NOPSEMA for spills >80L (cc WA Department of Mines, Industry Regulation and Safety (DMIRS) at: petroleum.environment@dmirs.wa.gov.au).	Verbal.	ASAP and no later than 2 hours of incident.
			Written notification.	As soon as practicable after oral notification.
			Written report (FM0831- http://www.nopsema.gov.au/environmental-management/notification-and-reporting/).	As soon as practicable, but within 3 days of incident.
	NOPSEMA (if recordable incident) submissions@nopsema.gov.au	Requirement to provide monthly report for spills <80L	Written – monthly report	No later than 15 days after month ended
	National Offshore Petroleum Titles Administrator (NOPTA)	Requirement to notify as per Guidance Note (N-03000-GN0926) Notification and Reporting of Environmental Incidents.	Written report.	Within 7 days of the initial report being submitted to NOPSEMA.
Level 2 Spill				

From	To	Description	Type	Timing
IC (or delegate)	AMOSC +61 438 379 328 (24 hrs) amosc@amosc.com.au	Support organisation for spill response operations.	Verbal.	As soon as practicable.
	GHD +61 400 384 727	Support organisation for scientific monitoring.	Verbal.	As soon as practicable.
	WA Department of Biodiversity, Conservation and Attractions (DBCA) 08 9219 9108 State Duty Officer (OWR)	Provision of advice and support for Oiled Wildlife Response and/or oiling of shorelines / waters managed by DBCA.	Verbal.	As soon as practicable if potential for oiled wildlife and/or oiling of DBCA managed water/shorelines.
	Department of Agriculture, Water and the Environment (DAWE) Phone: +61 2 6274 1111 epbcmonitoring@environment.gov.au	Responsible for administration of EPBC Act in Commonwealth Waters and to be notified if spill threatening wildlife in Commonwealth Waters. This allows for timely response and for DAWE to provide an informed response to enquiries from media and stakeholders.	Written.	Within 7 days if spill incident injures of kills one or more of the following: • EPBC threatened, migratory and/or marine species. • Cetaceans.
	Commonwealth Director of National Parks 0419 293 465 (24 hour Marine Compliance Duty Officer)	Responsible for Australian (Commonwealth) Marine Parks. The notification should include: • Titleholder details • Time and location of incident (including name of marine park likely to be affected) • Response arrangements as per this OPEP (e.g. dispersant, contain and recover) • Contact details of response coordinator	Verbal.	As soon as practicable or within 3 hours of incident identification if spill enters or predicted to enter a Commonwealth Marine Park.
	WA DoT Maritime Environmental Emergency Response (MEER) Duty Officer 08 9480 9924 (24 hrs) marine.pollution@transport.wa.gov.au	Controlling Agency and HMA (Jurisdictional Authority) for responses in WA State waters to Level 2 spills originating in Commonwealth waters.	Verbal.	As soon as practicable and no later than 2 hrs of becoming aware of incident if spill enters or predicted to enter State waters.
		Requirement to submit POLREP for any spill so WA State response agencies can be alerted if required.	Written WA POLREP form (https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf).	As soon as practicable after verbal notification if spill enters or predicted to enter State waters.

From	To	Description	Type	Timing
			Written WA SITREP form (https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf).	If requested, within 24 hours if spill enters or predicted to enter State waters.

3.3 Source Control Plan

The highest priority for a spill incident is to prevent, stop and/or limit further loss of hydrocarbons into the marine environment. This will only be attempted if personnel safety is not compromised and source control actions do not further risk or impact the environment. In most circumstances, the net benefit of source control outweighs the risks from further hydrocarbon release. The Source Control Plan is the vessel's SOPEP for a Level 2 spill with a generic overview in **Table 3-4**.

Table 3-4 Source control plan for Level 2 spill

<table>
<tr><th colspan="4">Source Control Plan: Vessel Fuel Tank Spill</th></tr>
<tr><td>Initiation Trigger</td><td colspan="3">Notification of a Level 2 vessel spill.</td></tr>
<tr><td>Aim</td><td colspan="3">Safely stop loss of MDO/MGO from fuel tank rupture to minimise releases to the marine environment.</td></tr>
<tr><td rowspan="4">Procedure</td><td>Required Timeframe and Action (if safe)</td><td>Responsible</td><td>Tick When Complete</td></tr>
<tr><td>Day 0 - Implement SOPEP MDO/MGO spill reduction measures as appropriate such as:
• Reduce ruptured tank head (pressure) driving MDO/MGO spill by dropping or pumping tank contents into empty or slack tank;
• Consider pumping water into leaking tank to create water cushion to prevent further MDO/MGO loss;
• If affected tank not easily identified, reduce MDO/MGO in tanks in vicinity of suspected area if vessel stability not compromised;
• Attempt repair and plugging of hole or rupture;
• Evaluate transfer of MDO/MGO to other vessels; and/or
• Trim or lighten vessel to avoid further damage to intact tanks.</td><td>Vessel Master</td><td>☐</td></tr>
<tr><td>Day 1 after AMSA request - Mobilise support vessel to location if requested by AMSA.</td><td>IMT</td><td>☐</td></tr>
<tr><td>Ongoing - Use on-board spill kits to clean-up oil from deck. Oily waste will be bagged, labelled and segregated into bunded hazardous waste area. Hazardous wastes to be transferred onshore with licensed waste management contractor and disposed at suitably classed State waste disposal facility.</td><td>Vessel Master</td><td>☐</td></tr>
<tr><td rowspan="2">Resources Required</td><td>Resource</td><td colspan="2">Available From: (Refer to Section 6.2)</td></tr>
<tr><td>Support vessel</td><td colspan="2">Supplier(s) as per the external services contracting strategy (Section 6.2).</td></tr>
<tr><td>Termination Criteria</td><td colspan="3">Direct observation: MDO/MGO from ruptured fuel tank is secured on the vessel and actions have been taken to prevent any further release, or that no more MDO/MGO can be released.</td></tr>
<tr><td>Key Response Documents</td><td colspan="3">Vessel SOPEP.
Kanga-1 Geophysical and Geotechnical Site Survey OPEP – This document.</td></tr>
<tr><td>Environmental Performance Outcome</td><td colspan="3">Contain the unplanned MDO/MGO release from a Level 2 vessel fuel tank rupture.</td></tr>
<tr><td>Control Measure</td><td>Performance Standard</td><td colspan="2">Measurement Criteria</td></tr>
<tr><td rowspan="2">Vessel SOPEP</td><td>SapuraOMV Lead Engineer will ensure a SOPEP copy is in the Perth office prior to the survey for IMT reference if a Level 2 spill.</td><td colspan="2">Copy of Vessel SOPEP in SapuraOMV offices.</td></tr>
<tr><td>Vessel Master activates SOPEP source control measures immediately after fuel tank rupture.</td><td colspan="2">Vessel and communication logs.</td></tr>
<tr><td rowspan="2">OPEP</td><td>IMT activates mobilisation of support vessel as soon as practicable after Level 2 spill notification, if requested by AMSA.</td><td colspan="2">Incident response logs.</td></tr>
<tr><td>IMT provides further support of Source Control Plan if requested by AMSA.</td><td colspan="2">Incident response logs.</td></tr>
</table>

Refer to **EP Section 8.6** for Environmental Performance Outcomes, Performance Standards and Measurement Criteria relating to potential environmental risks from implementation of oil spill response.

3.4 Monitor and Evaluate Plan

The overall aim of the Monitor and Evaluate Plan (i.e. operational monitoring) is to:

- Understand the behaviour of the spill.
- Maintain situational awareness to inform the IMT and update the IAP accordingly.

In short, operational monitoring information is required to plan and to maintain appropriate response arrangements, which is achieved through:

- Forecasting environmental receptors at risk of impact.
- Identifying environmental receptors that have been impacted.
- Informing response escalation and de-escalation processes.

The Monitor and Evaluate Plan will be coordinated by the Controlling Agency (AMSA in Commonwealth waters and/or DoT in State waters). SapuraOMV will participate in monitoring and evaluation as directed by the Controlling Agency in a Support Agency role. This section provides the immediate actions of the Monitor and Evaluate Plan that will be initiated by SapuraOMV during a Level 2 spill if requested by AMSA.

3.4.1 OS1: Hydrocarbon Surveillance and Tracking

Surveillance and tracking of the spill will commence as instructed by the IMT (through IC or delegate) and/or the On Scene Commander (Vessel Master for tracking buoy and initial survey vessel surveillance) when conditions are conducive (e.g. safety).

3.4.1.1 Spill Tracking Buoys

Deployment of an oil spill tracking buoy in the spill from the vessel allows the slick's trajectory to be followed and thereby inform response planning. One spill tracking buoy will be on the survey vessel during the Activity. Monitoring of the buoy's location will be undertaken through AMOSC's online web-based tracking capability.

3.4.1.2 Satellite Imagery

Satellite imagery can identify and track surface oil distributions and movements. Satellite imagery can be accessed via AMOSC's Konsberg Satellite Service (KSAT).

3.4.1.3 Aerial and Vessel Surveillance

Aerial surveillance will be the preferred method while vessel surveillance will be undertaken opportunistically.

Initial observations will be provided by the survey vessel's crew (Level 2 spill).

Aviation resources to conduct aerial surveillance activities (including aerial observers) will be sourced by AMSA. Additional surveillance aircraft can be commissioned on short notice by the IMT if required. SapuraOMV can source trained aerial observers through AMOSC.

GPS coordinates and date/ time observations will be recorded to allow estimates of the spill extent along with any marine fauna sightings. The thickness of the slick will be estimated by trained observers with the Bonn Agreement Oil Appearance Code (BAOAC) (Bonn Agreement 1998). Observations will be recorded and filed with supporting photographic images or video records, and provided to the IMT upon shift changes and/or return to airport/port.

Table 3-5 Operational study 1: hydrocarbon surveillance and tracking

<table>
<tr><th colspan="4">Operational Study (OS) OS1: Hydrocarbon Surveillance and Tracking</th></tr>
<tr><td>Initiation Trigger</td><td colspan="3">Notification of a Level 2 spill</td></tr>
<tr><td>Aim</td><td colspan="3">Tracking buoy, satellite imagery, vessel (opportunistic) and/or aerial surveillance as required to support AMSA to determine the size and trajectory of the slick, and to identify any oiled wildlife.</td></tr>
<tr><td rowspan="8">Procedure</td><th>Required Timeframe and Action</th><th>Responsible</th><th>Tick if Complete</th></tr>
<tr><td>Within 1 hour – Launch tracking buoys from vessel</td><td>Vessel Master</td><td>□</td></tr>
<tr><td>3 hours of AMSA request – Initiate mobilisation of additional aerial surveillance support (aircraft, observers) if requested by AMSA</td><td>IMT</td><td>□</td></tr>
<tr><td>3 hours of AMSA request – Initiation of satellite imagery surveillance support if requested by AMSA</td><td>IMT</td><td>□</td></tr>
<tr><td>24 hours of AMSA request – Initiate mobilisation of additional vessel surveillance support if requested by AMSA</td><td>IMT</td><td>□</td></tr>
<tr><td>Ongoing if AMSA request – Tracking buoy location provided via online web-based portal</td><td>AMOSC</td><td>□</td></tr>
<tr><td>Ongoing if AMSA request – Aerial and vessel observations regularly recorded in observer log and provided to AMSA at least on daily basis:
• Time, date and person recording the log
• Weather and sea state
• Location and presence of oil
• Appearance of oil (using BAOAC)
• Any photos, sketches and videos
• Presence of any oiled or non-oiled wildlife
• Presence of any marine fauna and actions taken to adhere to Part 8 of the EPBC Regulations 2000, Part 5 of the Biodiversity Conservation Regulations 2018 and the Australian Guidelines for Whale and Dolphin Watching (NRMMC, 2005[1]).</td><td>Vessel Observer via IMT</td><td>□</td></tr>
<tr><td>Ongoing if satellite imagery support requested by AMSA
• Provide ad hoc satellite imagery as required.</td><td>IMT</td><td>□</td></tr>
<tr><td rowspan="6">Resources Required</td><th>Resource</th><th colspan="2">Available From: (Refer to Section 6.2)</th></tr>
<tr><td>1x Tracking buoys</td><td colspan="2">AMOSC</td></tr>
<tr><td>Helicopter</td><td colspan="2" rowspan="2">Supplier(s) as per the external services contracting strategy (Section 6.2)</td></tr>
<tr><td>Fixed wing aircraft</td></tr>
<tr><td>Oil spill observers</td><td colspan="2">AMOSC (core group through AMOSPlan)</td></tr>
<tr><td>Ad hoc satellite imagery</td><td colspan="2">AMOSC (via KSAT)</td></tr>
<tr><td>Escalation and Maintenance of Response</td><td colspan="3">SapuraOMV will maintain an adequate level of surveillance to inform response planning and to gauge the effectiveness of response measures throughout an incident if and as requested by AMSA. SapuraOMV is capable of contracting on an as-needs basis, vessels, aircraft and oil spill observers to escalate and to maintain vessel-based surveillance over the duration of an incident. Refer to the external services contracting strategy in Section 6.2.</td></tr>
<tr><td>Termination Criteria</td><td colspan="3">AMSA in consultation with SapuraOMV terminates the response.</td></tr>
<tr><td>Key Response Documents</td><td colspan="3">• The OS1 sampling and anlaysis plan (SAP) provides guidance and a checklist for the IMT to support AMSA (if requested) surveillance of a spill
• Operational and Scientific Monitoring Implementation Plan (OSMIP)
• Operational and Scientific Monitoring Framework (OSMF)
• Oil Spill Monitoring Handbook (CSIRO, 2016)</td></tr>
</table>

[1] NRMMC (Natural Resource Management Ministerial Council). (2005). The Australian National Guidelines for Whale and Dolphin Watching.

Environmental Performance Outcome	Provide AMSA, IMT and regulatory authorities with reliable and timely tracking buoy location and surveillance observations to inform response planning and operations if requested by AMSA.		
Control Measure	**Performance Standard**	**Measurement Criteria**	
Satellite Tracking Buoys	1x tracking buoy deployed from vessel within 1 hour of spill or as determined by Vessel Master.	• Vessel storage logs confirm tracking buoys on-board • Emails between IMT and AMOSC confirm start of tracking • Incident log records tracking buoys deployed • Web-based buoy tracking portal • Tracking buoy data archive	
Aerial Surveillance	Aerial surveillance support mobilisation is initiated within 3 hours of AMSA request.	• IMT logs	
	Surveillance support observations to AMSA on at least on daily basis if and as requested by AMSA.	• IMT logs • Aerial and vessel surveillance records	
Satellite Imagery	Satellite imagery support provided *ad hoc* (as required) if requested by AMSA.	• IMT logs • Satellite imagery archive	
Refer to **EP Section 8.6** for Environmental Performance Outcomes, Performance Standards and Measurement Criteria relating to potential environmental risks from implementation of oil spill response.			

3.5 Scientific Monitoring Plan

The Operational and Scientific Monitoring Plan (OSMP) is comprised of an overarching Operational and Scientific Monitoring Framework (OSMF), an Kanga-1 activity specific Operational and Scientific Monitoring Implementation Plan (OSIMP) and a library of Sampling and Analysis Plans (SAPs). The Monitor and Evaluate Plan is the operational monitoring component of the OSMP, and is designed to rapidly provide key information to inform/guide response planning and implementation during an incident. If requested by AMSA, SapuraOMV will provide support on the surveillance and tracking of the hydrocarbon slick from a Level 2 vessel-based spill incident as per the Monitor and Evaluate Plan in **Section 3.4**.

In the event of a Level 2 spill, scientific monitoring studies may be activated, if requested by AMSA and/or in consultation with AMSA, by SapuraOMV to quantify the impacts and the subsequent recovery from the spilled oil and response activities (**Table 3-6**).

Table 3-6 Scientific monitoring plan for Level 2 spill

Scientific Monitoring Plan			
Initiation Trigger	Notification of a Level 2 spill		
Aim	Characterise short (impact) and long-term (recovery) environmental effects from a Level 2 spill.		
Procedure	**Required Timeframe and Action**	**Responsible**	**Tick if Complete**
	Within 1 day of of AMSA request – Activate scientific studies SM04 (Marine Waters) and SM05 (Marine Sediments), if requested by AMSA.	IMT	□
	Ongoing – Evaluate need for initiation of other scientific studies on daily basis if not initiated, if requested by AMSA.	IMT	□
	Ongoing – Implementation of the scientific monitoring program, if requested by AMSA.	Scientific Monitoring Contractor(s)	□
	After cessation of Monitor and Evaluate Plan (operational monitoring) – Carry our SM13 (Hindcast Modelling), if requested by AMSA.	Scientific Monitoring Contractor(s)	□
Resources Required	**Resource**	**Available From: (Refer to Section 6.2)**	
	Plant, equipment, personnel	Refer to SAPs of scientific studies for equipment needs and OSMIP for plant and personnel needs.	

		Vessels to be sourced from call-off arrangements as per the external services contracting strategy (**Section 6.2**). Scientific personnel to be sourced from scientific monitoring supplier(s) as per the external services contracting strategy (**Section 6.2**).
Escalation and Maintenance of Response	SapuraOMV will maintain an adequate level of scientific monitoring as required to characterise impacts and subsequent recovery from a Level 2 spill. Refer to the external services contracting strategy in **Section 6.2**.	
Termination Criteria	The short and long term environmental effects from the spill have been adequately characterised under endorsement by the Scientific Advisory Group (SAG)[2].	
Key Response Documents	• SAPs provide guidance and a checklist for the IMT to initiate scientific monitoring • OSMIP • OSMF	
Environmental Performance Outcome	Identify and describe appropriate scientific monitoring studies and demonstrate an appropriate degree of readiness to implement those programs in the event of an oil spill.	
Control Measure	**Performance Standard**	**Measurement Criteria**
Scientific Monitoring	Maintain capability to implement scientific monitoring program.	Environmental consultant capability review completed prior to each activity to demonstrate readiness to implement scientific monitoring studies.
Refer to **EP Section 8.6** for Environmental Performance Outcomes, Performance Standards and Measurement Criteria relating to potential environmental risks from implementation of oil spill response.		

Of the thirteen scientific studies that comprise SapuraOMV's OSMP in **Table 3-7,** three will be initiated for a Level 2 spill if requested by AMSA. The OSMIP provides performance outcomes, performance standards and measurement criteria for each of the scientific studies. **Table 3-7** provides the initiation triggers for each of the scientific studies that are also in the OSMIP.

Table 3-7 OSMP scientific studies

Scientific Study	Initiation Trigger	Initiate for Level 2 Spill
SM01 Weathering Assessment	Not applicable.	No
SM02 Dispersant Effects on Subsurface Concentrations		
SM03 Ecotoxicology		
SM04 Marine Waters	Immediately fora **Level 2** spill if requested by AMSA.	Yes
SM05 Marine Sediments		
SM06 Subtidal and Intertidal Habitats	Not applicable.	No
SM07 Mangrove Habitat		
SM08 Turtle Nesting		
SM09 Marine Megafauna		
SM10 Marine Avifauna		
SM11 Hydrocarbons in Representative Commercial and Recreational Fish		
SM12 Marine Invertebrates		
SM13 Hindcast Modelling	After cessation of response activities for a **Level 2** spill if requested by AMSA.	Yes

[2] The SAG provides external review of scientific monitoring reports, and provide guidance regarding scientific monitoring including whether termination criteria have been satisfactorily met.

3.6 Oiled Wildlife Response (OWR) Plan

The OWR Plan includes pre-emptive capture or hazing of wildlife to prevent contact with hydrocarbons, treatment and rehabilitation of impacted wildlife and euthanasia of critically impacted wildlife individuals.

The decision to implement OWR will be made by the Controlling Agency (AMSA in Commonwealth waters and/or DoT in State waters/shorelines). with advice from Oiled Wildlife Advisors (OWAs) on the basis of operational monitoring information and the operational NEBA process as part of the ongoing IAP process (refer to **Section 4**). SapuraOMV will participate in OWR as directed by the Controlling Agency in a Support Agency role. This section provides the immediate actions of the OWR Plan that will be initiated by SapuraOMV during a Level 2 spill if requested by AMSA.

The WAOWRP (DPaW, 2014a) sets out the minimum standard for OWR in WA in both State and Commonwealth waters. The PROWRP (DPaW, 2014b) outlines specific 'on ground' information to carry out an OWR specific to this Pilbara. In the event that wildlife has been impacted or there is imminent threat of impact requiring OWR, the WAOWRP and PROWRP will be activated. A Wildlife Division Coordinator (WDC) will be established and will liaise with the IMT via the Planning Section Lead to identify and coordinate the necessary OWR functional units of the Oiled Wildlife Division (OWD), as per the WAOWRP. The OWAs and WDC will provide advice to the IMT on the level of OWR required and will ensure provision of resources to support OWR operations.

Table 3-8 OWR plan for Level 2 spill

OWR Plan			
Initiation Trigger	Notification of a Level 2 spill.		
Aim	• Safely and effectively capture oiled wildlife for treatment and rehabilitation and release; • Prioritise treatment of species of conservation value and carry out humane triage operations when necessary and resources are limited; and • Prevent (e.g. hazing) oiling of wildlife threatened by slicks.		
Procedure	**Required Timeframe and Action**	**Responsible**	**Tick if Complete**
	Within 3 hours of AMSA request – Initiate mobilisation of OWAs through notification of DBCA and AMOSC if requested by AMSA.	IMT	□
	Within 1 day of AMSA request – Request AMOSC to mobilise OWR initial response equipment situated in Exmouth and Broome, and containerised washing facility in Fremantle if requested by AMSA.	IMT	□
	Within 1 day of AMSA request – Notify DoT Maritime Environmental Emergency Response (MEER) unit and DBCA that OWR equipment is being mobilised if requested by AMSA.	IMT	□
	Within 1 day of AMSA request – Request AMOSC to establish Oiled Wildlife Division (OWD) and Wildlife Division Coordinator (WDC) as described in the WAOWRP and PROWRP if requested by AMSA.	IMT	□
	Within 1 week of AMSA request – Request AMOSC to mobilise trained OWR responders and resources as described in the WAOWRP and PROWRP if requested by AMSA.	IMT	□
	Ongoing if AMSA request [3] - Capture and treatment of offshore oiled wildlife (e.g. seabirds). Auditory hazing techniques may also be used for moving seabirds out of 'at risk' areas.	IMT	□
Net Benefit Assessment of Response	If hazing likely to result in a net adverse impact then do not carry out. If capture and rehabilitation causes a net impact (stress of capture causes increased mortality than presence of oil alone) then do not carry out. Re-assess during incident.		

[3] Ongoing response will be implemented per the WAOWRP and PROWRP once activated and this specific response may or may not be required.

<table>
<tr><th colspan="3">OWR Plan</th></tr>
<tr><td rowspan="10">Resources Required</td><th>Resource</th><th>Available From: (Refer to Section 6.2)</th></tr>
<tr><td>OWA and WDC</td><td>WA DBCA
AMOSC core group</td></tr>
<tr><td>Trained OWR (operations) personnel to act as field supervisors of OWR recovery and rehabilitation teams</td><td>AMOSC core group
WA SRT (escalation)</td></tr>
<tr><td>Support personnel</td><td>Supplier(s) as per the external services contracting strategy (Section 6.2)</td></tr>
<tr><td>DBCA and veterinarians</td><td>Guidance on basis of WAWORP and PROWRP for Western Australia</td></tr>
<tr><td>OWR kits</td><td>AMOSC at Broome and Exmouth</td></tr>
<tr><td>OWR container cleaning stations</td><td>AMOSC mobilised from Fremantle and Geelong</td></tr>
<tr><td>Support aircraft</td><td rowspan="3">Supplier(s) as per the external services contracting strategy (Section 6.2)</td></tr>
<tr><td>Support vessels</td></tr>
<tr><td>Waste contractor</td></tr>
<tr><td>Escalation and Maintenance of Response</td><td colspan="2">SapuraOMV has membership with AMOSC for OWR equipment as per the external services contracting strategy in Section 6.2. SapuraOMV can also request additional AMOSC resources through the AMOSPlan if required and requested by AMSA.</td></tr>
<tr><td>Termination Criteria</td><td colspan="2">AMSA in consultation with SapuraOMV terminate the response.</td></tr>
<tr><td>Key Response Documents</td><td colspan="2">Western Australian OWR Plan (WAOWRP) (DPaW, 2014a).
Pilbara Region OWR Plan (PROWRP) (DPaW, 2014b).</td></tr>
<tr><td>Environmental Performance Outcome</td><td colspan="2">Provide resources to support OWR strategies as directed by DBCA and AMSA.</td></tr>
<tr><th>Control Measure</th><th>Performance Standard</th><th>Measurement Criteria</th></tr>
<tr><td rowspan="3">OWR</td><td>Maintain AMOSC membership to ensure that equipment and personnel can be provided.</td><td>• AMOSC membership contract.</td></tr>
<tr><td>DBCA notified as soon as possible after sighting of oiled wildlife if such communications by IMT requested by AMSA.</td><td>• IMT records verify that verbal and/or written notification was provided to DBCA and AMSA as soon as possible after sighting.</td></tr>
<tr><td>AMOSC OWR equipment deployed to site within timeframes if requested by AMSA as directed by DBCA and AMSA.</td><td>• Incident records verify oiled wildlife response kits are deployed to site as directed by DBCA and AMSA.</td></tr>
<tr><td colspan="3">Refer EP Section 8.6 for Environmental Performance Outcomes, Performance Standards and Measurement Criteria relating to potential environmental risks from implementation of oil spill response.</td></tr>
</table>

4. Ongoing Response

The IAP describes the ongoing response strategies and its efficient implementation on a strategic and tactical level as selected via an operational NEBA[4].

The initial IAP is to undertake the Immediate Actions as set out in **Section 3**.

The SapuraOMV IMT action planning process is based on the Incident Command System (ICS). A brief overview of the process to update the IAP is illustrated in **Figure 4-1**. This process will be used by the IMT to tailor the response to the Level 2 spill depending on the behaviour of the spill and effectiveness of the response measures.

Phase 1: Understand the situation

Gather information (Monitor and Evaluate Plan, responder feedback) to gain situational awareness

Phase 2: Establish incident objectives

Update IAP objectives to guide appropriate response measures

Phase 3: Develop the plan

i - Assess current response priorities and suitable response strategies
ii - Assess suitable response strategies by NEBA process
iii - Assess available response resources and need to increase/decrease to meet IAP objectives

Phase 4: Prepare and disseminate the plan

Compile plan and distribute/brief the plan once approved by IC

Phase 5: Execute, evaluate and revise plan

i - Brief the response team with command structures and tasks allocated
ii - Constantly evaluate the response strategies with feedback from onsite teams and information from the Monitor and Evaluate Plan
iii - Following comletion of operational phase or new information regarding behaviour of spill, recommence IAP process at phase 1.

Figure 4-1 IAP process

4 Refer to **Appendix A** for a description of the strategic NEBA that served as a basis to select primary, secondary and rejected response strategies.

5. Forward Operations

5.1 Marine Operations Base

The SapuraOMV IMT as a Support Agency may be requested by AMSA to manage part of the response to a Level 2 spill. Under such circumstances, and if SapuraOMV's role requires a Marine Operations Base, it will likely be located at Dampier. For a Level 2 spill, a relatively modest base is envisaged primarily to assist the IMT with the primary response strategies (i.e. support vessel to assist with source control of the survey vessel, vessel surveillance logistics, and operational and scientific monitoring logistics). In the event OWR is needed, the Marine Operations Base may also serve as a potential OWR centre.

If instructed by the IMT, the Marine Operations Base contractor (see **Section 6.2**) will assist SapuraOMV in the establishment, maintenance and removal of the Marine Operations Base, and will subcontract services to provide required services (e.g. catering facilities, power, ablutions). If required, a Waste Management Contractor (see **Section 6.2**) will set up the non-oily and oily waste management infrastructure, and associated logistics at the Marine Operations Base. Supplies to the Marine Operations Base will be provided by (or the responsibility of) the Marine Operations Base contractor (see **Section 6.2**).

5.2 Oiled Wildlife Response Centre

In addition to the AMOSC OWR container, OWR operations require significant space with freshwater supply, wastewater and solid waste handling, lighting, power, crib room and toilets. If required and requested by AMSA, the OWR Centre will be established and maintained initially at the Marine Operations Base. The PROWRP also identifies three potential locations in Karratha/Dampier that may be suitable for an OWR Centre. The OWR Centre will be established and supported by AMOSC initially via OWR kits located in Exmouth and mobilisation of an OWR container from Fremantle. AMSA also have an OWR kit and container that could be mobilised from Karratha.

5.3 Waste Transfer Station

Even though significant waste volumes are not anticipated to be generated (i.e. no substantive response efforts in terms of shoreline clean-up, offshore containment and recovery, and protection and deflection measures), if required and requested by AMSA a waste transfer station will be established at the Marine Operations Base by the Waste Management Contractor (see **Section 6.2**).

5.4 Logistical Considerations

Estimated travel times between the Marine Operations Base and Perth and the Activity's Operational Area are summarised in **Table 5-1** and ilustrated in **Figure 5-1**.

Table 5-1 Estimated travel times between Marine Operations Base in Dampier and Operational Area / Perth (hours)

Location 1	Location 2	Flight (~800 km/hr)	Road (~100 km/hr)	Vessel (~12 knots, ~22 km/hr)	Helicopter (~105, knots, ~195 km/hr)
Operational Area	Dampier	-	-	6	1
Perth	Dampier	2	16	-	-

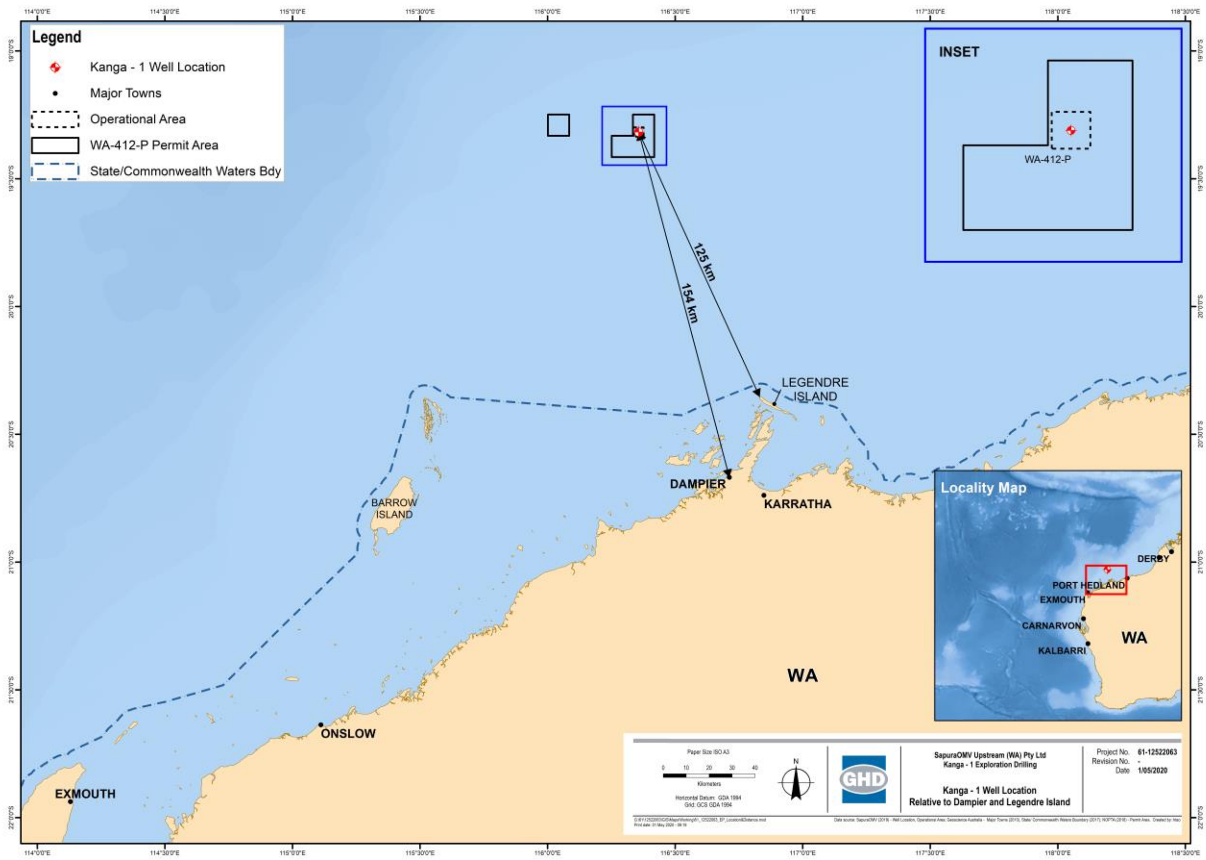


Figure 5-1 Distances between the survey area and the likely Marine Operations Base

6. OPEP Resourcing

6.1 Incident Management Team

Level 2 incidents will require specialist skills for a period of time. First response IMT manning will be fulfilled by personnel from SapuraOMV and other contracted organisations along with provision of additional support. The SapuraOMV duty roster is updated weekly.

6.2 External Services Contracting Strategy

A Level 2 spill may require deployment of spill response resources for a period of time. SapuraOMV resources primarily comprise the CMT (if activated) and key IMT roles. Most spill response resources (i.e. equipment, plant, people) will be obtained from third party contractors, industry support groups and government support agencies (collectively referred to as 'external services'). Key external services organisations, summary roles and service provision arrangements are provided in the external services contracting strategy in **Table 6-1**.

In the event of a Level 2 spill and activation of relevant external resources, the IMT will:

- Request and receive up to date equipment inventories from each contractor.
- Response personnel will be resourced as per the external services contracting strategy in **Table 6-1**.
- An up to date contact list will be maintained by SapuraOMV on their network and in hardcopy in the Emergency Control Centre (ECC) to rapidly mobilise OPEP resources in the event of a Level 2 incident.

6.3 Confirmation of Availability and Mobilisation of Spill Response Plan, Personnel and Equipment

Availability of spill response plant, equipment and personnel from external organisations (e.g. AMOSC) and mobilisation timeframes in this OPEP will be confirmed and related contracts/arrangements/agreements will be in place prior to the Kanga-1 survey campaign.

Table 6-1 External services contracting strategy

Scope of Work	Supplier/s	Contract Type	Contract Strategy	Specific Requirements/ Notes	Deployment Timeframe
Support vessels	From list of qualified vessel contractors.	A	In-place prior to start of Activity.	Hydrocarbon surveillance (refer to **Section 3.4.1**).	As per **Section 3.3**.
Oil spill response vessels	From list of qualified contractors.	A or B	Additional vessel call off option in place with primary vessel supplier prior to survey or contracted when required direct from local suppliers.	Scientific monitoring plan (refer to **Section 3.5**). Oiled wildlife response (refer to **Section 3.6**).	As per **Sections 3.4.1**, **3.5** and **3.6**).
- 1x satellite tracking buoy to leave on vessel during Activity. - Further tracking buoys to call-off as necessary	AMOSC	A and B	In-place prior to start of Activity.		As per **Section 3.4.1.**
Oil Spill Observers	AMOSC	B	In-place prior to start of Activity.	Trained observers and sampling of spilled oil and water column.	As per **Section 3.4.1.**
Helicopter services for spill monitoring	Helicopter provider(s) e.g. CHC Others as-qualified	A	In-place prior to start of Activity.	Dedicated helicopter will be available if not otherwise required for safety reasons.	As per **Section 3.4.1.**
Fixed-wing aircraft services for spill monitoring	Aircraft from qualified contractors.	A or B	Call off arrangement via primary aerial services provider or sourced directly/via broker as/when required.	Provision of aircraft for aerial observation.	As per **Section 3.4.1.**
Satellite imagery	AMOSC	B	In-place prior to start of Activity.	May be accessed direct or via AMOSC.	As per **Section 3.4.1.**
Oil Spill Trajectory Modelling	APASA via AMOSC	B	In-place prior to start of Activity	Provision of OSTM and 3D modelling during spill.	As per **Section 3.4.1.**
Scientific Monitoring personnel and equipment	Environmental consultancy e.g. GHD	B	In-place prior to start of Activity.	Implement Scientific Monitoring Plan. Equipment to be provided on third-party basis	As per **Section 3.5**.
Oiled wildlife response (OWR) personnel, kits, container	AMOSC WA DBCA	B E	In-place prior to start of Activity. N/A.	Implement oiled wildlife response plan including long-term care, relocation and remediation of marine fauna.	As per **Section 3.6**.

Scope of Work	Supplier/s	Contract Type	Contract Strategy	Specific Requirements/ Notes	Deployment Timeframe
Waste management equipment and services.	Licensed waste management contractor e.g. Cleanaway, Veolia	A	In-place prior to start of Activity.	Set up secure temporary waste storage/laydown areas at marine operations base, manage collection, transport and delivery of wastes to licensed facilities, and maintain all relevant waste documentation. Waste will include non-hazardous and potentially hazardous solid and liquid wastes.	As-per **Section 3.6, 5.1** and **5.3**.
Mainland transport Contractor	Logistics and transport contractor e.g. Toll Other qualified contractors.	B	In-place prior to start of Activity.	Vehicles and drivers (with controlled waste licences), hotshot services, transport of personnel mobilised during response.	Immediate.
Marine Operations Base.	Logistics e.g. Toll	A	In-place prior to start of Activity.	Established at primary supply port (Dampier) Storage, laydown and biosecurity areas, forklifts, office space warehouses, lifting equipment, cleaning and servicing facilities.	Immediate.
Contract Type					
A: SapuraOMV dedicated contract					
B: SapuraOMV call-off agreement					
C: SapuraOMV global call-off agreement					
D: Assignment from other titleholders/operators					
E: No contract arrangement needed					

7. Termination Strategy

The decision to terminate the spill response will be made by the Controlling Agency. The decision to terminate spill response strategies will be made with consideration of the following:

- The effectiveness and environmental benefit of the current response activities.
- The significance of any impacted environmental receptors.
- The potential for further spills/leaks.
- The potential for additional environmental damage caused by ongoing clean-up activities.
- An assessment of prevailing weather conditions that has the potential to cause increased risk to response teams or to increase the efficacy in weathering hydrocarbons.
- Termination criteria, as adopted by the Controlling Agency have been met.

The Controlling Agency IC will ensure that all relevant organisations, stakeholders and personnel are notified to stand down once the decision to terminate or the termination criteria have been satisfied.

8. OPEP Administration

8.1 OPEP Custodian

Name: Michael Chua (Senior HSE Specialist, HSE Department)

Address: SapuraOMV Upstream (WA) Pty Ltd
Level 2, 251 St Georges Terrace
Perth, WA 6000

Telephone: 08 6118 4990 (office)

Email: michael.chua@sapura-omv.com

8.2 OPEP Custodian Responsibilities

The OPEP custodian is responsible for:

- Distribution and tracking copies of the OPEP as per the distribution list.
- Monitoring associated response plans (i.e. NatPlan, WA State Hazard Plan-MEE, WAOWRP) and other related resources, and ensuring spill response activities meet requirements/guidelines.
- Accepting, assessing and collating any requests for revision of the OPEP.
- Making revisions to the OPEP.
- Maintaining an up to date digital version of the OPEP and a copy of the OPEP as currently issued.
- Issuing updates for revised sections of the OPEP.

8.3 OPEP Review and Update

This OPEP will be reviewed and updated as necessary in response to one or more of the following:

- When major changes occur that may affect the spill response coordination or capabilities.
- Changes to the EP that affect spill response coordination or capabilities (e.g. a significant increase in spill risk).
- Following routine testing of the OPEP if improvements are identified.
- After an actual Level 2 incident.

The OPEP custodian (or delegate) will review the OPEP in accordance with SapuraOMV HSE procedures and relevant statutory requirements.

Any significant changes in the content of the OPEP or capability to respond to an incident will be captured through SapuraOMV's Management of Change (MoC) Standard (refer to **EP Section 9.4.4**). SapuraOMV will submit a revised OPEP to NOPSEMA as soon as practicable where there are significant changes to the content of the OPEP or capability to respond to an incident.

8.4 OPEP Training

All crew onboard the vessels will be trained (inducted) in the application of the vessel's SOPEP. Regular SOPEP drills and exercises are typically carried out on vessels in accordance with their SOPEP to maintain crew knowledge of response equipment and incident response procedures. This verifies emergency response efficiency, effectiveness of procedures and detects any failure in equipment. These drills include, but are not limited to spill response, collision, grounding, fire and explosion. All drills are documented, debriefings held and corrective actions identified (including revisions to the SOPEP) and tracked to completion by the Vessel Master.

All nominated personnel in this OPEP will be trained to an appropriate level to undertake their role in its implementation. Classroom training will be supported by drills and exercises to ensure that competencies are maintained.

SapuraOMV staff receive spill response training commensurate for their nominated OPEP roles as listed in **Table 8-1** where:

- IMO is the International Maritime Organisation ranking for oil spill response training.
- IPIECA is the Incident Management System SapuraOMV has adopted.
- The relevant training levels/courses are aligned with the Australian PMA Chemical, Hydrocarbons and Refining Training.

This OPEP relies on the supply of trained observers from other organisations (e.g. AMOSC, AMSA) therefore SapuraOMV will not be responsible for their training. A briefing on the Bonn Agreement oil appearance code (BAOAC) will be provided to relevant response personnel that can assist with the initial assessment of a spill in the event of an incident.

Table 8-1 Training requirements for IMT and ERT oil spill response personnel

Team	Oil Spill Response Position	Minimum Training Level Course
IMT	Incident Commander	IMO 3 / PMAOMIR418 / PMAOMIR320
	Operations Section Chief	PMAOMIR320
	Logistics Section Chief	PMAOMIR320
	Finance Section Chief	PMAOMIR320
	Planning Section Chief	PMAOMIR320
	Safety Officer	PMAOMIR320
	Liaison Officer	PMAOMIR320
	Public Information Officer	PMAOMIR320
ERT	Vessel Crew	Vessel SOPEP and response equipment

9. References

AMOSPLAN Ver.14.01, Australian Maritime Oil Spill Centre (AMOSC).

Australian Marine Safety Authority (AMSA) Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities (2015).

Bonn Agreement Oil Appearance Code (2004) Annex A of the Bonn Agreement Aerial Surveillance Handbook.

CSIRO (2016) Oil Spill Monitoring Handbook. Editors S. Hook, G. Batley, M. Holloway, P. Irving and A. Ross.

Department of Transport (2018). Western Australia State Hazard Plan for Maritime Environmental Emergencies. (An amalgamation of the Westplan-MOP and the Westplan-MTE). Version 0.1.01. December 2018. Available at: https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_StateHazardPlanMaritimeEnviroEmergMEE.pdf

Department of Parks and Wildlife (DPaW) (2014a). Western Australian Oiled Wildlife Response Plan (WAOWRP). Version 1.1, 18/08/2014. Available at: https://www.dpaw.wa.gov.au/management/marine/marine-wildlife/marine-wildlife-response?showall=&start=2

Department of Parks and Wildlife (DPaW) (2014b). Pilbara Region Oiled Wildlife Response Plan (PROWRP). Version 1.1, 27/10/2014. Available at: https://www.dpaw.wa.gov.au/management/marine/marine-wildlife/marine-wildlife-response?showall=&start=2

[GHD] GHD Pty Ltd (2020). Kanga-1 Geophysical and Geotechnical Survey EP Marine Diesel Oil Spill Modelling Report. April 2020. Report to SapuraOMV Upstream (Western Australia).

National Plan for Maritime Environmental Emergencies (NatPlan). Australian Maritime Safety Authority (AMSA),

Appendix

Appendix A

Preliminary NEBA and ALARP Justification for OPEP Response Strategies

A1 Source of Risk

The Kanga-1 Geophysical and Geotechnical Site Survey EP has identified credible worst case hydrocarbon spill scenarios as:

- **Level 2**: Vessel collision with a surface MDO spill from a ruptured fuel tank of 200 m^3 (**EP Section 8.1**).
- **Level 1**: Small spills with a worst case surface release of up to 10m^3 (**EP Section 8.2**).

A2 Strategic NEBA of Potential Response Strategies

The overall aim of spill response is to effectively mitigate damage to the environment. Not all potential spill response strategies may be environmentally effective for a particular spill. This section describes a strategic NEBA undertaken across potential spill response strategies for a Level 2 credible worst-case spill scenario for this Activity (**Table A-1**). The NEBA evaluates each potential spill response strategy on the following criteria: environmental benefit(s), environmental risk(s)/impact(s), and operational constraints. If a response strategy is considered applicable, then its appropriateness as a primary or secondary response strategy is evaluated. This strategic NEBA employed the following process:

- List the available potential response strategies for the Level 2 spill.
- Identify the benefit, environmental impact(s)/risk(s) and operational constraints of each response strategy.
- Evaluate the applicability of each response strategy for a Level 2 credible worst case scenario.
- Identify applicable strategies for a Level 2 credible worst case scenario.

The response strategies are further delineated as:

- <u>Primary response strategies</u> are to be used as soon as possible in the event of a spill.
- <u>Secondary response strategies</u> are to be implemented if needed and when practicable with net environmental benefit.
- Not applicable (N/A) response strategies.
- Rejected response strategies due to lack of net environmental benefit.

In the event of an oil spill, operational NEBAs will be undertaken by the Incident Management Team (IMT) during the ongoing Incident Action Plan (IAP) process to evaluate response options that have a net environmental benefit (**OPEP Section 4**). Hence, the combination of spill response strategies and their implementation may evolve over time as conditions change on the basis of these operational NEBAs.

Table A-1 Strategic NEBA of potential response strategies for Level 2 spill

Spill Response Strategy	Overview of Environmental Benefits	Associated Environmental Risks	Operational Constraints	Response Applicability		Primary or Secondary Response	Justification Note
Source Control – Secondary Containment	Limit MDO/MGO spill (e.g. transfer from leaking tank) to reduce potential impacts to sensitive receptors.	No significant impacts.	Health and safety considerations may delay implementation under certain circumstances.	Level 2	Yes	Primary	Will be the immediate primary response to limit further spill of oil to environment.
Source Control – SOPEP	Limits spill of MDO/MGO to environment using applicable strategies for reducing volumes of hydrocarbon released as stated in the SOPEP.	No significant impacts.	Health and safety considerations may delay implementation under certain circumstances.	Level 2	Yes	Primary	Will be the immediate primary response to limit further spill of MDO/MGO to environment.
In-situ Burning	Combustion of oil on sea surface reduces the volume remaining on the surface. Generates modest waste products for recovery and disposal.	Generate highly visible smoke, particulates and atmospheric emissions including greenhouse gases. Incomplete combustion residues that have marine toxicity and can physically impact marine biota (e.g. coating of gills and feathers). Smoke particulates have associated health risks. Vessel-based impacts/risks (e.g. routine discharges, marine fauna collision).	Need thick oil film for ignition/ combustion (5-10 mm). Availability of fireproof booms. Never carried out in Australia; limited experience nationally. Ignition of oil requires specialist training and equipment. Calm conditions required for safe and controlled burning [wind limited to 10 kts, and wave height <1 m (IPIECA-IOGP, 2015) [5]].	Level 2	No	Reject	Mobilisation time too long to burn oil of sufficient thickness due to natural dispersion after short spill release period. No predicted impacts/risks to nearshore and/or shoreline environmental sensitivities.
Monitor and Evaluate (Operational Monitoring)	Spill monitoring required for real-time decisions to identify emerging environmental risks, plan spill response, and assess response effectiveness	Vessel- and aircraft- based impacts/risks (e.g. routine discharges, marine fauna collision, noise emissions).	Visual observations at night or during poor weather restricted. Stringent safety requirements for aerial and marine operations.	Level 2	Yes	Primary	Surveillance activities ensure constant monitoring and evaluation of the spill.

[5] IPIECA-IOGP (2015). Dispersants: Subsea Application. Good Practice Guidelines for Incident Management and Emergency Response Personnel. IOG Report 533.

Spill Response Strategy	Overview of Environmental Benefits	Associated Environmental Risks	Operational Constraints	Response Applicability		Primary or Secondary Response	Justification Note
			Coordination of multiple vessels/ aircraft in limited area (SIMOPS).				
Dispersant Application	Accelerates breakup of surface oil thereby reducing potential impacts to surface (e.g. seabirds) and shoreline (e.g. mangroves) receptors. Reduction in onshore hydrocarbon waste disposal.	Add chemical (dispersant) to environment when spill may not greatly impact environmental receptors. Vessel- and aircraft- based impacts/risks (e.g. routine discharges, marine fauna collision, noise emissions). No removal of hydrocarbons from environment. Increased subsurface hydrocarbon concentrations.	Dispersant application for MDO/MGO spills not overly effective. Insufficient mobilisation time for episodic release.	Level 2	No	Reject	Mobilisation time too long to apply dispersant on oil of sufficient thickness due to natural dispersion after short spill release period. No predicted impacts/risks to nearshore and/or shoreline environmental sensitivities.
Mechanical Dispersion	Enhances dispersion and break-up of surface hydrocarbons to facilitate natural degradation processes.	Increased subsurface oil concentrations. Vessel-based impacts/risks (e.g. routine discharges, marine fauna collision).	Vessel propellers do not cavitate so inefficient at breaking up slicks. OHS risks through ignition or inhalation of vapours. Small oil droplet size required otherwise resurfaces, so limited benefit for some oils unless combined with dispersant application.	Level 2	No	Reject	No predicted impacts/risks to nearshore and/or shoreline environmental sensitivities.
Containment and Recovery	Contain spill as close as possible to the source. Reduce spread of surface oil and thereby risks to sensitive receptors. Removal of oil from the environment.	Vessel-based impacts/risks (e.g. routine discharges, marine fauna collision). Recovered oil waste and oily water. Oily waste from contaminated booms and response vessels.	Require low currents (<0.5 m/s) and waves that limit operability in Operational Area. Require minimum slick concentration of 10 g/m^2. Logistics, equipment and labour intensive.	Level 2	No	Reject	Mobilisation time too long to implement containment and recovery response on oil of sufficient thickness due to natural dispersion after short spill release period. No predicted impacts/risks to nearshore and/or shoreline environmental sensitivities.

Spill Response Strategy	Overview of Environmental Benefits	Associated Environmental Risks	Operational Constraints	Response Applicability		Primary or Secondary Response	Justification Note
Shoreline Protection and Deflection	Protect nearshore and shoreline target receptors by deflecting oil to lower priority areas.	Vessel-based impacts/risks (e.g. routine discharges, marine fauna collision). Anchoring risks/impacts on seabed habitat to secure booms. Oily waste from contaminated booms and response vessels. Potential impacts/risks to nearshore and shorelines habitats to which oil deflected.	Low winds, waves and surface currents needed for boom operations of booms in nearshore environments. Require minimum slick concentration of 10 g/m^2 in proximity to shoreline. Logistics, equipment and labour intensive.	Level 2	No	Reject	Mobilisation time too long to implement containment and recovery response on oil of sufficient thickness due to natural dispersion after short spill release period. No predicted impacts/risks to nearshore and/or shoreline environmental sensitivities.
Shoreline Clean-up	Shoreline oil removal to reduce environmental impacts/risks. Reduce aesthetic impact. Reduce impacts/risks of oil re-entrainment from shoreline into marine environment.	Potential disturbance to shoreline habitats (e.g. turtle nesting) from operations (e.g. trampling by personnel and equipment) may outweigh environmental benefits in some circumstances, and natural passive reduction (e.g. biodegradation, photo-oxidation) preferred. Disposal of large volumes of oily sediment and water waste. Temporary storage of waste may contaminate areas not contacted by the spill. Response (personnel, equipment, staging areas) increase risk of cross contamination from impacted to non-impacted sites.	Logistics and labour intensive, including waste management considerations. Personnel management and coordination to reduce environmental and safety risks/impacts. Applicability influenced by shoreline characteristics (e.g. substrate type; exposure to wave action; biological, social, heritage or economic values), amount of oiling and site access.	Level 2	No	Reject	No predicted impacts/risks to nearshore and/or shoreline environmental sensitivities.

Spill Response Strategy	Overview of Environmental Benefits	Associated Environmental Risks	Operational Constraints	Response Applicability		Primary or Secondary Response	Justification Note
Oiled Wildlife Response	Reduce impacts to wildlife (e.g. onshore exclusion barriers, hazing, pre-emptive capture). Collection and rehabilitation of oiled wildlife and return to similar suitable habitat.	Vessel-based impacts/risks (e.g. routine discharges, marine fauna collision). Hazing can accidentally drive wildlife into spills or separate groups/individuals (e.g. parents/ offspring pairs). Potential for fauna injury due to inappropriate collection/ handling during pre-emptive and post-oiled capture. Rehabilitation activities could result in inadequate/ inappropriate animal handling leading to stress/ injury/ death. Inappropriate fauna relocation leads to disorientation/ stress.	Logistics and labour intensive. Calm conditions necessary for capture operations. May require navigation of multiple vessels within a small area. Availability of suitable space/ location to handle rehabilitation and fauna treatment. Utilisation of skilled veterinarians for treatment of oiled wildlife.	Level 2	Yes	Secondary	Applicable as a secondary response strategy if surveillance and tracking of the spill identifies oiled wildlife. Spill predicted to be solely in offshore waters, so seabirds at greatest risk for a short duration.
Scientific Monitoring	Determine extent, severity and persistence of environmental impacts and subsequent recovery of an oil spill.	Vessel-based impacts/risks (e.g. routine discharges, marine fauna collision).	For a Level 2 spill Monitor and Evaluate Plan to inform Scientific Monitoring design given nature of spill as a discrete slick from a short release duration incident.	Level 2	Yes	Primary	Though the spill is predicted to occur solely in offshore waters, evaluation of marine water and sediment quality along the slick trajectory to be carried out, and impacts will be further characterised from hindcast modelling of the incident.

A3 ALARP Demonstration for Control Measures of Selected Response Strategies

The ALARP principle (**EP Section 6.6**) is applied to potential control measures of the selected spill response strategies from the preliminary NEBA in **Section A2**. An overview of the ALARP demonstration process of each potential response strategy's control measure is outlined in **Table A-2**, and a summary of the assessment is provided in **Table A-3**.

Table A-2 Overview of ALARP demonstration for potential control measures associated with response strategies

<table>
<tr><th>Column Title</th><th colspan="3">Description</th></tr>
<tr><td>Control Measures</td><td colspan="3">A potential control measure of the response strategy.</td></tr>
<tr><td>Hierarchy of Control (HOC)</td><td colspan="3">Hierarchy of control category of the control measure.</td></tr>
<tr><td>Rationale</td><td colspan="3">Why is the control measure for the response strategy under consideration?</td></tr>
<tr><td>Environmental Benefit</td><td colspan="3">What environmental benefit is derived from the control measure?</td></tr>
<tr><td rowspan="8">Effectiveness</td><td colspan="3">What is the effectiveness of the control measure in terms of functionality, availability, reliability, survivability, independence and compatibility?</td></tr>
<tr><td rowspan="2">Criteria</td><td colspan="2">Effectiveness Ranking</td></tr>
<tr><td>Low</td><td>High</td></tr>
<tr><td>Availability</td><td>SapuraOMV has no external arrangement or internal processes in place to expedite timely provision of equipment/ resources.</td><td>SapuraOMV has equipment/resources on standby, and/or contracts, arrangements, or MOU's in place for provision of equipment/resources.</td></tr>
<tr><td>Functionality</td><td>Control measure does not materially reduce risk/ impact.</td><td>Control measure does materially reduce risk/ impact.</td></tr>
<tr><td>Reliability</td><td>Control measure not tested in Australian waters and/or low assurance assigned to success rate.</td><td>Control measure has been tested in Australian waters and/or high assurance assigned to success rate.</td></tr>
<tr><td>Survivability</td><td>Control measure has low operational timeframe and will need to be replaced regularly to maintain effectiveness.</td><td>Control measure has a high operational timeframe and will not need to be replaced regularly to main effectiveness.</td></tr>
<tr><td>Independence/ Compatibility</td><td>Control measure is reliant on other control measures in place and/or is not compatible with other control measures in place.</td><td>Control measure is not reliant on other control measures in place and/or can be implemented with other control measures.</td></tr>
<tr><td>Implement Time</td><td colspan="3">How soon could the control measure be implemented?</td></tr>
<tr><td>Cost/ Effort</td><td colspan="3">What is the cost to implement the control measure during the Activity?</td></tr>
<tr><td>ALARP Summary</td><td colspan="3">Accept or reject control measure on basis of ALARP.</td></tr>
</table>

Table A-3 ALARP demonstration of potential control measures for selected response strategies

Key: A: Availability; F = Functionality, R: Reliability; S = Survivability; IC: Independence/ Capability.

Control Measures	HOC	Rationale	Environmental Benefit of Implementing Response	Effectiveness	Implement Time	Cost/ Effort	ALARP Summary
Source Control – Vessel Spill (Primary Strategy for Level 2 Spill)							
No source control of vessel source.	N/A	Do nothing option.	None	N/A	N/A	Nil	**Reject** – Source control from Level 2 vessel spills required.
Spill response in accordance with vessel SOPEP.	Administrative	Legislative requirement of MARPOL Annex I (Prevention of Pollution by Oil).	Rapid vessel spill response	**A, F, R, S, IC:** High.	<2 hours	Minor	**Accept** – Control measure legislative requirement. Effective and minor cost implications.
Spill clean-up equipment tested, maintained and available on vessel.	Administrative	Legislative requirement of MARPOL Annex I (Prevention of Pollution by Oil).	Rapid vessel spill response	**A, F, R, S, IC:** High.	Immediate and ongoing	Minor	**Accept** – Control measure legislative requirement. Effective and minor cost implications.
Monitor and Evaluate (Operational Monitoring) (Primary Strategy for Level 2 Spill)							
No monitoring and evaluation of the spill	N/A	Do nothing option.	None	N/A	N/A	Nil	**Reject** – Monitor and evaluate (operational monitoring) strategy required to inform response planning and to assess response effectiveness.
Monitor and evaluate operations managed by IMT through IAP process and guided by Operational and Scientific Monitoring Plan (OSMP).	Administrative	Information to plan and to monitor spill and response measures.	Knowledge of spill and evaluation of response measures to inform spill response.	**A, F, R, S, IC:** High.	Immediate and ongoing.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.

Control Measures	HOC	Rationale	Environmental Benefit of Implementing Response	Effectiveness	Implement Time	Cost/ Effort	ALARP Summary
Quasi-real-time Oil Spill Trajectory Modelling (OSTM) predictions to support operational NEBA during IAP process.	Administrative	Predicted spill trajectory, response effectiveness and risks to environmental receptors.	Forecast spill behaviour to manage response and identify sensitive receptors at risk.	**A, F, R, S, IC:** High.	<2 hours to initiate.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Initial observations and reporting by survey vessel crew.	Administrative	Provision of basic information (location, weather and spill character) to inform initial response.	Early indication of spill direction to target immediate response and establish situational awareness.	**A, F, R, S:** High. **IC:** Low (dependent on safety considerations).	Immediate.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Spill tracking buoy on survey vessel.	Administrative	Tracking buoy deployed during Level 2 spill to track spill movement and gain situational awareness.	Track spill movement to target response and maintain situational awareness.	**A, F, R, S, IC:** High	Immediate	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Provision of satellite imagery.	Administrative	Quasi-real-time imagery to inform IMT of spill location and size.	Inform IMT IAP process to target response to yield greatest environmental benefit.	**A, F, R, S, IC:** High.	<24 hours for acquisition of first image.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Aerial monitoring by trained observers (AMOSC) in AMSA NatPlan fixed-wing aircraft.	Administrative	Fixed-wing aircraft and trained observers improve spill surveillance.	Ongoing spill surveillance to inform spill response.	**A, F, R, S, IC:** High.	Subject to aircraft and personnel availability, but ~24 hours.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Dedicated monitoring plant, equipment and personnel on call-off arrangement.	Administrative	Dedicated monitoring resources improve spill monitoring.	Ongoing spill monitoring to inform spill response.	**A, F, R, S, IC:** High.	Subject to vessel and personnel availability, but <2 days from call-off.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.

Control Measures	HOC	Rationale	Environmental Benefit of Implementing Response	Effectiveness	Implement Time	Cost/ Effort	ALARP Summary
Trained observers, and dedicated equipment and plant on standby for aerial- and/or vessel-based surveillance.	Administrative	Decrease response time for plant (aircraft, vessels) and trained observers improve spill surveillance.	Ongoing spill monitoring to inform spill response.	**F, R, S, IC:** High. **A:** Low (trained observers [AMOSC] typically have fulltime jobs and may not be released for standby).	24 hours to get airborne or depart port with standby observers.	Standby costs of ~>$1M to maintain plant and trained observers.	**Reject** – Control measure costs grossly disproportionate to the limited environmental benefit.
Oiled Wildlife Response (Primary Strategy for Level 2 Spill)							
No oiled wildlife response (OWR).	N/A	Do nothing option.	None.	N/A	N/A	Nil	**Reject** – The OWR strategy is mandatory to mitigate impacts/risks to marine fauna.
OWR operations managed by IMT through IAP process.	Administrative	OWR operations directed to situations with a net environmental benefit.	Positive (greatest) environmental benefit from OWR to be based upon information (situational awareness) to inform wildlife collection.	**A, F, R, S, IC:** High.	Immediate and ongoing.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
AMOSC membership for OWR personnel.	Administrative	Access to range of oiled wildlife response personnel from AMOSC.	Ability to treat oiled wildlife with appropriate personnel and equipment.	**A, F, R, S, IC:** High.	<2 days	Moderate	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Equipment for OWR available Perth, Geelong and Broome via AMOSC.	Administrative	Wildlife treated on mainland or other site(s) where mobilised container(s) resides.	Ability to treat oiled wildlife, and triage when appropriate.	**A, F, R, S, IC:** High.	<24 hours for triage equipment. <2 days for Perth container with mobilisation.	Moderate	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.

Control Measures	HOC	Rationale	Environmental Benefit of Implementing Response	Effectiveness	Implement Time	Cost/ Effort	ALARP Summary
OWR implementation (e.g. establishing work areas) to follow pre-designated plans of WAOWRP and PROWRP.	Administrative	Reduce potential impacts to sensitive receptors be avoiding areas of environmental sensitivity.	Ability to treat oiled wildlife, and triage when appropriate.	**A, F, R, S, IC:** High.	Immediate and ongoing.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Equipment for OWR (and triage) available (pre-positioned) at strategic locations.	Administrative	Wildlife treated at strategic locations where standby container(s) resides.	Ability to treat oiled wildlife in proximity to pre-positioned sites rapidly.	**F, R, S, IC:** High. **A:** Low (AMOSC cannot provide container on standby, must purchase with long lead times).	<1 day for equipment and personnel.	Not available through AMOSC. Procure and maintain container >$50,000.	**Reject** – Control measure grossly disproportionate to the limited environmental benefit.
Scientific Monitoring (Primary Strategy for Level 2 Spill)							
No scientific monitoring of the spill.	N/A	Do nothing option.	None	N/A	N/A	Nil	**Reject** – Scientific monitoring response strategy required to quantify spill impacts and subsequent recovery.
Scientific monitoring managed by IMT through IAP process, guided by Operational and Scientific Monitoring Plan (OSMP) and the Scientific Advisory Group (SAG).	Administrative	Ensure monitoring information acquired to monitor effectiveness of spill response. Ensure scientific objectives (characterise impacts and subsequent recovery) are met.	Understand impacts to sensitive environmental receptors from the spill and response, and subsequent recovery.	**A, F, R, S, IC:** High.	Immediate and ongoing.	Minor	**Accept** – Control measure practicable and effective, and not disproportionate to environmental benefit.
Call-off arrangements in place for scientific monitoring.	Administrative	Readiness to implement scientific monitoring.	Ability to monitor spill impacts and recovery of	**A, F, R, S, IC**: High.	<1 day initiate mobilisation.	Minor	**Accept** – Control measure practicable and effective, and not

Control Measures	HOC	Rationale	Environmental Benefit of Implementing Response	Effectiveness	Implement Time	Cost/ Effort	ALARP Summary
			sensitive receptors.		<7 days monitoring implementation.		disproportionate to environmental benefit.
Scientific monitoring personnel, plant and equipment on standby.	Administrative	Reduce response time to initiate scientific monitoring.	Marginal increase in ability to monitor sensitive receptors prior to hydrocarbon contact relative to non-standby arrangement.	**A, F, R, S, IC:** High.	<6 hours initiate mobilisation. <3 days monitoring implementation	>$1M	**Reject** – Control measure is grossly disproportionate compared to limited environmental benefit.

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