ENVIRONMENT PLAN SUMMARY

MUTINEER EXETER DEVELOPMENT
CESSATION OF PRODUCTION ENVIRONMENT PLAN

ME-7000-REP-0265

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22/05/2018	A	For internal review	SV	JE	GH
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FIGURES

UNITS OF MEASUREMENT

‘	Foot (30 cm)
“	Inch (2.54 cm)
bbl	Barrel (159 litres)
°C	Degrees centigrade
g/m^2	Grams per square metre
ha	Hectare
Hz	Hertz
kl	Kilolitre (1,000 litres)
km	Kilometre (1,000 metres)
km^2	Square kilometres
L	Litre (1,000 ml)
m	Metre (100 cm)
m^2	Square metre
m^3	Cubic metre
mg/L	Milligrams per litre
ml	Millilitre
mm	Millimetre
m/s	Metres per second
nm	Nautical mile (1.856 km)
ppb	Parts per billion
ppm	Parts per million
t	Tonne (1,000 kg)
µm	Micrometre (micron)

ABBREVIATIONS and ACRONYMS

AFMA	Australian Fishing Management Authority
AHS	Australian Hydrographic Service
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
APPEA	Australian Petroleum Production and Exploration Association
ASTBIA	Australian Southern Bluefin Tuna Association
BIA	Biologically Important Area
CIV	Completion isolation valve
CFA	Commonwealth Fishing Association
CoP	Cessation of Production – the period commencing with NOPSEMA acceptance of a CoP EP and continuing until field decommissioning.
DoD	Department of Defence
DoE	Department of the Environment (former)
DoEE	Department of the Environment and Energy
DoF	Department of Fisheries (WA) (former)
DMIRS	Department of Mines, Industry Regulation and Safety
DNP	Director of National Parks
DoT	Department of Transport (WA)
DP	Dynamic positioning
DPIRD	Department of Primary Industries and Regional Development (DPIRD) - Fisheries Division
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities former
DTM	Disconnectable Turret Mooring
EMBA	Environment that May Be Affected
EHS	Environment, Health and Safety
EHSMS	Environment, Health and Safety Management System
EMBA	Environment that may be affected
EMS	Environmental Management System
EP	Environment Plan
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FPSO	Floating Production Storage Offloading Facility
GHG	Greenhouse Gas
HSE	Health, Safety and Environment
IAPP	International Air Pollution Prevention
IMS	Invasive marine species
IOPP	International Oil Pollution Prevention
ISPP	International Sewage Pollution Prevention
ISU	Integrated services umbilicals
KEFs	Key Ecological Features
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
MARS	Maritime Arrivals Reporting System

MBC	Marine Border Control
MDO	Marine diesel oil
ME	Mutineer Exeter Development
MEFF	Mutineer Exeter Fletcher Finucane (wells)
MoC	Management of Change
MNES	Matter of National Environment Significance
MPFM	Multi-phase flow meter
MPP	Multi-phase pumps
NEBA	Net Environmental Benefit Analysis
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NWS	North West Shelf
OCNS	Offshore Chemical Notification Scheme
OIW	Oil in water
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OPGGS Act	*Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OSRL	Oil Spill Response Limited
OVID	Offshore Vessel Inspection Database
OWS	Oily water separator
P&A	Plug and abandonment
PMS	Planned Maintenance System
PSZ	Petroleum Safety Zone
PUDU	Production umbilical distribution unit
ROV	Remotely operated vehicle
Santos	Santos Pty Ltd
SFRT	Subsea First Response Toolkit
SMPEP	Shipboard Marine Pollution Emergency Plan
SOPEP	Shipboard Oil Pollution Emergency Plan
SMS	Santos Management System
STP	Sewage treatment plant
UTA	Umbilical termination assembly
WAFIC	West Australian Fishing Industries Council
WOMP	Well Operations Management Plan
XT	Xmas tree

1 INTRODUCTION

Santos Limited (Santos) is the registered titleholder for production licences WA-54-L, WA-26-L and WA-27- L, which cover the Fletcher-Finucane, Mutineer and Exeter light crude oil fields. Production from these fields (the Mutineer Exeter Development) involved a series of subsea wells linked by subsea pipelines via a disconnectable turret mooring (DTM) to a Floating Production Storage and Offloading unit (FPSO).

Production has now ceased, with all wells shut in and the FPSO scheduled to depart in 2018. To reduce the potential for hydrocarbon leaks from flowlines and umbilicals, Santos will flush all remaining well fluids from the system back to the FPSO prior to its departure and fill the pipelines with treated seawater, in accordance with the approved *Mutineer Exeter Development Field Operations* Environment Plan (EP).

The subsea infrastructure will then remain in place 'preserved' during a 'cessation of production' phase that will continue until field decommissioning occurs. Management to ensure that the impacts and risks associated with activities during the cessation phase are reduced to as low as reasonably practicable (ALARP) and acceptable levels are described in a *Cessation of Production* (CoP) EP, accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R) on 14 May 2018.

This Summary has been prepared in accordance with the requirements of regulation 11 (4) of the OPGGS(E)R and summarises the accepted CoP EP.

The cessation phase is expected to continue for the acceptability period of the EP (5 years) during which time Santos will commence planning for the final decommissioning and abandonment of the field. Decommissioning and abandonment activities will be subject to another, separate NOPSEMA EP assessment process.

1.1 Nominated Liaison Person Contact Details

The Santos nominated liaison person is:

Name:	Glen Herrera (Manager Operations MEFF)
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2 ACTIVITY DESCRIPTION

2.1 Overview

During the cessation phase, the cleaned and preserved subsea infrastructure will remain in place and inspections of the DTM and the subsea production system will occur to ensure ongoing integrity. These inspections and interventions are performed by remotely operated vehicles (ROV) or diving from a support vessel.

2.2 Location

The Mutineer-Exeter Development is located approximately 150 km due north of Dampier on the NW coast of Australia. The development lies in permits WA-26-L (Mutineer), WA-27-L (Exeter) and WA-54-L (Fletcher-Finucane) in water depths ranging from approximately 130 m to 160 m (Figure 2-1).

The activities covered by the EP will occur in the vicinity of the field infrastructure, located within the EP operational area shown on Figure 2-1 and with the coordinates presented in Table 2-1.

Development infrastructure comprises a subsea production system with a production centre in each of the Mutineer, Exeter, Fletcher and Finucane fields. The subsea production system is connected to a DTM, which remains submerged once disconnected from the FPSO. For the cessation period, all well valves will remain shut in, isolating the reservoirs from the subsea production system. The subsea production system has been flushed of hydrocarbons and will remain filled with treated seawater in a preservation state.

The layout of the field infrastructure is shown on Figure 2-2. The coordinates of field infrastructure are provided in Table 2-2.

Table 2-1: Coordinates for the Operational Area

GDA 94, MGA 50	Latitude			Longitude		
	Degrees	**Minutes**	**Seconds**	**Degrees**	**Minutes**	**Seconds**
	19	10	55.0	116	34	03.5
	19	10	55.0	116	48	20.1
	19	22	20.3	116	48	20.1
	19	22	20.3	116	34	03.5

Table 2-2: Geographical Location of Manifolds and DTM

GDA 94, MGA 50	Latitude			Longitude		
	Degrees	**Minutes**	**Seconds**	**Degrees**	**Minutes**	**Seconds**
DTM	19	16	33.5	116	36	45.6
Mutineer manifold	19	15	32.8	116	38	16.3
Exeter manifold	19	18	35.4	116	33	41.1
Fletcher manifold	19	14	43.8	116	47	43.9
Finucane manifold	19	18	17.3	116	45	32.9

2.3 Inspection Activities

Typical subsea inspection and intervention activities carried out during the cessation phase may include:

- Spider buoy moorings inspection;
- Subsea production system inspection (subsea trees, multi-phase pumps (MPPs) and manifolds, multi-phase flow meters (MPFMs), flowlines, jumpers, integrated services umbilicals (ISUs), production umbilical distribution units (PUDUs), umbilical termination assembly (UTAs), etc.).

- Riser and umbilical inspection;
- Cathodic potential measurements;
- Subsea equipment intervention, e.g. operating valves;
- Debris clearance;
- Diving activities;
- Sediment grab sampling; and
- Recovery of dropped objects.

These activities are undertaken from vessels and may require marine growth removal from subsea infrastructure by one or more of the following methods: water jetting, mechanical brushing, and chemical cleaning.

2.3.1 Vessels

Offshore vessels for the inspection/intervention activities are yet to be confirmed. The types of vessels used will be vessels typical for offshore petroleum activities.

Vessels will not moor or anchor on location within the operational area during inspection/intervention activities. Vessel refuelling will not take place within the operational area.

2.3.2 Helicopters

No helicopter transfers to and from vessels are planned during the cessation activities; however, unplanned transfers may occur such as medical evacuations.

2.3.3 Diving Activities

Diving operations have been included as there is the possibility that diving is required to support the activities described in the EP. Diving is not considered to pose any credible environmental impacts or risks other than the impacts and risks associated with vessel use. Diving will take place from a dive support vessel accompanying the main inspection vessel.

2.4 Timing of Activities

The FPSO is scheduled to depart the field in 2018.

The preserved subsea infrastructure and DTM will remain *in situ* throughout the cessation phase.

During the cessation phase, campaigns will be conducted to carry out inspection and intervention/maintenance activities including ROV activities. Individual campaigns are expected to take 14 days.

The cessation phase is expected to continue for the acceptability period of the EP (5 years) during which time Santos will commence planning for the final decommissioning and abandonment of the field.

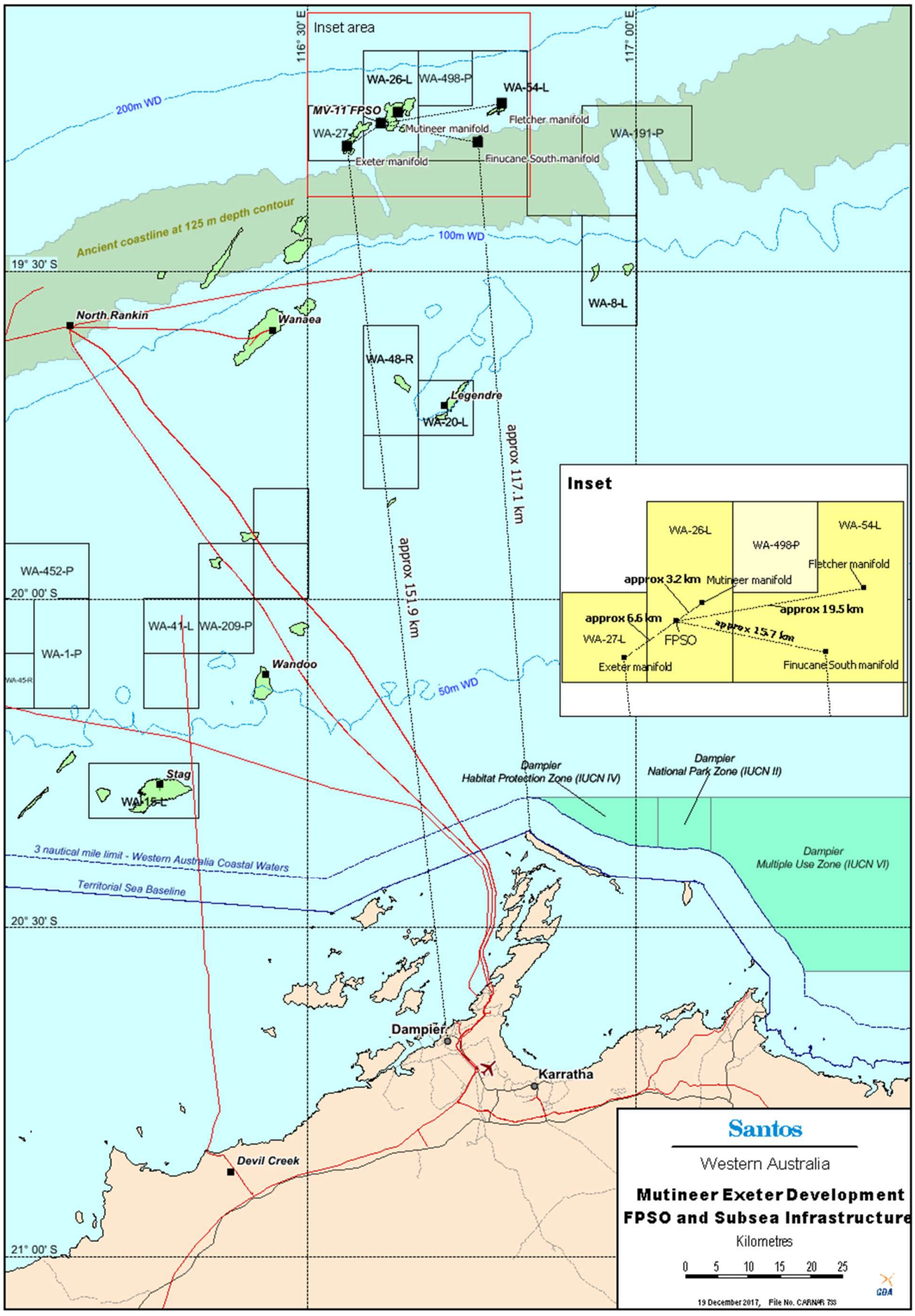
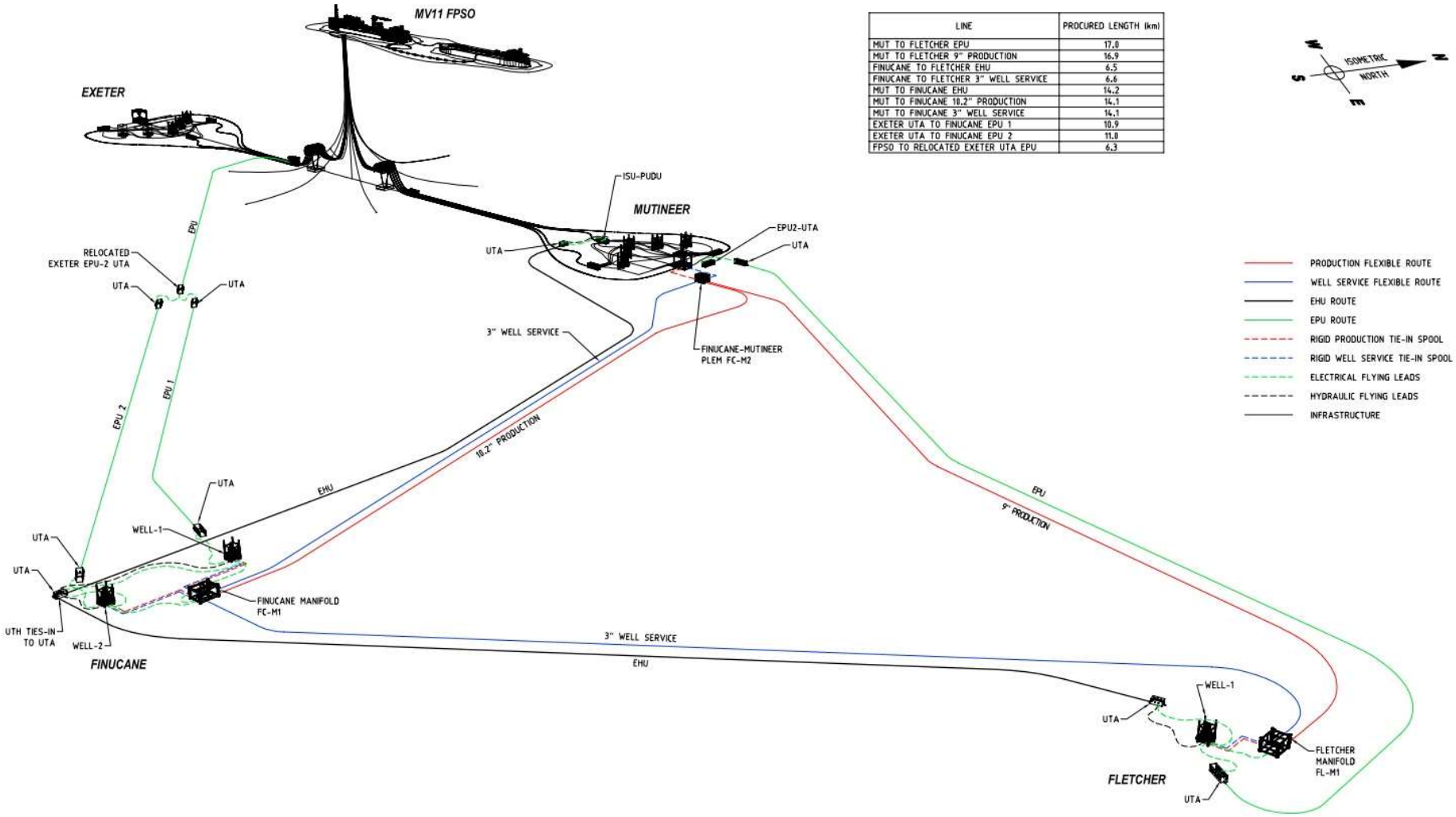


Figure 2-1: Location of the Mutineer Exeter Development Operational Area (Inset) and Facilities



LINE	PROCURED LENGTH (km)
MUT TO FLETCHER EPU	17.0
MUT TO FLETCHER 9" PRODUCTION	16.9
FINUCANE TO FLETCHER EHU	6.5
FINUCANE TO FLETCHER 3" WELL SERVICE	6.6
MUT TO FINUCANE EHU	14.2
MUT TO FINUCANE 10.2" PRODUCTION	14.1
MUT TO FINUCANE 3" WELL SERVICE	14.1
EXETER UTA TO FINUCANE EPU 1	10.9
EXETER UTA TO FINUCANE EPU 2	11.0
FPSO TO RELOCATED EXETER UTA EPU	6.3

Figure 2-2: Schematic of the Mutineer Exeter Development including Subsea Infrastructure

3 EXISTING ENVIRONMENT DESCRIPTION

3.1 Overview

The EP assesses environmental impacts and risks (Section 5) associated with the cessation activities described in Section 2 of this document. In determining the spatial extent of the environmental sensitivities that may be affected by the Activity, Santos considered both the defined area for planned events and unplanned events as well as the area that may be affected by credible worst-case hydrocarbon spills.

3.2 Environment That May Be Affected

A review of the environment values within the operational area included a search of the Commonwealth Department of the Environment and Energy (DoEE) Matters of National Environmental Significance (MNES) database and the National Conservation Values Atlas, as well as information gained through the consultation process. Specific aspects of the EMBA that are relevant to the assessment and management of risks and impacts, including particular values and sensitivities, are highlighted in the following sub-sections including a summary of the protected matters search. Further detail on the consultation process and outcomes is provided in Section 4.

3.2.1 Physical Environment

The operational area is located in Commonwealth waters offshore from Western Australia on the continental shelf of the North West Shelf (NWS) in the North-west bioregion, over 100 km away from the nearest coastline (Dampier archipelago), with the Montebello, Lowendal and Barrow Island complexes located over 180 km to the south-west. The water depths within the operational area range from approximately 130 to 160 m.

The NWS is a tropical arid region that has monsoonal climatic patterns with a pronounced cyclone season between December and March when the Kimberley experiences a wet season and the Pilbara is subject to sporadic and intense storms. During the summer months the north of the Region is subject to onshore winds while the Region's south experiences strong southerlies. During winter the winds moderate in the south and are generally offshore in the north.

Water temperatures range from 20-24°C and 24-28°C in winter and summer respectively, with a summer thermocline at 30-60 m. NWS is a tropical arid region with monsoonal climatic patterns with a cyclone season between December and March in which most rainfall occurs. Regional oceanography is strongly influenced by the warm, relatively low salinity waters of the Indonesian Throughflow. Ocean tidal currents are semi-diurnal with internal wave induced weak upwelling along the NWS shelf at depths of 50-500 m during the summer.

The operational area is located on the outer continental shelf. The sediments of the outer slope comprise sands and gravels, transitioning to muds with increasing distance offshore. An August 2011 geophysical and geotechnical survey of the operational area indicated a relatively flat, smooth and featureless seabed with the only structural features associated with existing Santos petroleum production infrastructure (Neptune Geomatics, 2011). Only one seabed type was identified in the operational area by the survey, this being low relief unconsolidated (high volume) calcareous silty fine sand (Neptune Geomatics, 2011).

3.2.2 Benthic Habitats in the Wider Region

The EMBA is located in sub-tropical to tropical waters within the NW Marine Region and include Barrow Island, the Montebello Islands, the Muiron Islands, Dampier archipelago the Ningaloo Region as well as mainland regions. This section provides an overview of the environmental sensitivities within the EMBA.

The North West Marine Region is characterised by shallow-water tropical marine ecosystems with high species richness. The high species richness of the region is thought to be associated with the diversity of habitats available.

Shallow waters are generally more biologically diverse than open water environments, the latter which characterise the operational area. Shallow, intertidal and shoreline habitats are located over 110 km from the operational area, with the Dampier Archipelago the nearest mainland inshore area and the Montebello, Lowendal and Barrow island complexes over 180 km to the south-west.

Given the depth of water (ranging from 130–160 m) and the nature of the seabed, few significant benthic resources are expected to be located across the operational area, in line with the featureless sandy seabed (refer to previous Section 3.2.1 for geophysical description of seabed habitat within the operational area). The depth of water limits the occurrence of algae, seagrass, corals and some fish and reptile species, while the absence of hard substrates prevents many forms of sessile fauna from colonising the seabed (e.g. sponges). Sandy substrates of the NWS in this region are considered to support a low density of benthic communities of bryozoans, molluscs and echinoids, with sponge communities found only in areas containing hard substrates.

3.2.3 Marine Protected Areas and Key Ecological Features

There are no Australian Marine Parks (Commonwealth) or State Marine Reserves or Management Areas within the operational area. The nearest Australian Marine Parks are the Dampier and Montebello Marine Parks, located over 115 km south of the operational area.

Based on the predictions from the spill modelling, two Australian (Commonwealth) Marine Parks lie within the EMBA in the event of worst-case hydrocarbons spills:

- Montebello Marine Park; and
- Argo-Rowley Terrace Marine Park.

In addition, the following State Marine Parks, Reserves and Management Areas lie within the environment that may be affected by hydrocarbons contacting shorelines in the event of a worst-case spill (catastrophic loss of wellhead integrity):

- Carnarvon Region and Surrounds: Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve; Bernier and Dorre Islands Nature Reserves; Dirk Hartog Island National Park;
- Ningaloo Region: Ningaloo Marine Park and the Muiron Islands Marine Management Area; Cape Range National Park; Jurabi and Bundegi Coastal Parks;
- Barrow Island: Barrow Island Marine Park; Barrow Island Marine Management Area; Barrow Group Nature Reserves;
- Montebello Islands: Montebello Islands Marine Park;
- Dampier Region/Archipelago: Dampier Archipelago (including Burrup Peninsula);
- Eighty Mile Beach Marine Park;
- Browse Island: Browse Island Nature Reserve.

Key Ecological Features (KEFs) are components of the marine ecosystem that are considered to be important for biodiversity or ecosystem function and integrity of the commonwealth marine area. One KEF occurs within the operational area, the Ancient Coastline at 125 m Depth Contour. Three KEFs are predicted to fall within the spill EMBAs.

- Ancient Coastline at 125 m Depth Contour;
- Glomar Shoals; and
- Continental Slope Demersal Fish Communities.

3.2.4 Wetlands of International Importance

The operational area does not intercept any Wetlands of International Importance (Ramsar sites).

Based on the predictions from the spill modelling, one Ramsar site (Eighty Mile Beach) lies within the environment that may be affected by hydrocarbons contacting shorelines in the event of a worst-case spill (from a catastrophic loss of wellhead integrity).

3.2.5 Commercial Fisheries

Commonwealth and State-managed fisheries that have fishing zones that overlap the operational area are listed in Table 3-1. Fisheries status reports (DoF, 2016; ABARES, 2016) and consultation undertaken for the EP indicates that potential fishing effort in the operational area currently only occurs in one of these fisheries (the Pilbara Demersal Scalefish Fisheries) and at low levels (refer to Section 4).

Table 3-1: Commonwealth and state managed fisheries permitted within the Operational Area

Fishery
Commonwealth Fisheries
Southern Bluefin Tuna Fishery
Western Skipjack Tuna Fishery
Western Tuna and Billfish Fishery
State Managed Fisheries: North Coast Bioregion
Pearl Oyster Managed Fishery (Zone 1, Zone 2, Zone 3)
Pilbara Demersal Scalefish Fisheries – includes trap and trawl (zone 2) fisheries
Whole of State Fisheries
Beche-de-mer Fishery
Marine Aquarium Fish Fishery
Mackerel Managed Fishery (Area 2 and 3)
Onslow and Nickol Bay Prawn Limited Entry Managed Fishery
West Coast Deep Sea Crab (interim) Managed Fishery

3.2.6 Tourism and Recreation

Tourism and recreational use, including recreation fishing, is unlikely in the operational area due to the water depth, absence of seabed features, distance (~150 km) from the mainland and island shorelines, and the presence of the exclusion area around existing petroleum infrastructure (noted on navigation charts).

3.2.7 Oil and Gas Industry

The operational area is in a relatively isolated area of the NWS with respect to the main oil and gas operational and exploratory fields. The flowlines and associated platforms and subsea wells that form part of the NWS Joint Venture are the major petroleum features in the immediate region. Further to the southwest of the operational area (about 195 km), Quadrant Energy Ltd operates the Varanus Island oil and gas hub.

3.2.8 Commercial Shipping

The closest shipping lane is the Dampier shipping fairway, which is the main northern approach to the Port of Dampier, and lies approximately 5 nm east of the EMBA. General marine vessel traffic may traverse the operational area.

3.2.9 Heritage Values and Shipwrecks

There are no listed World Heritage Areas, aboriginal heritage, cultural heritage places or records of shipwrecks within or in the vicinity of the operational area.

Based on the predictions from the spill modelling, the following World Heritage Areas and National Heritage Properties and National Heritage Properties lie within the environment that may be affected by hydrocarbons contacting shorelines in the event of a worst-case spill (from a catastrophic loss of wellhead integrity).

- World Heritage Areas:
  - Ningaloo Coast;
  - Shark Bay.
- National Heritage Properties:
  - Ningaloo Coast;
  - Shark Bay;
  - Dampier Archipelago (including the Burrup Peninsula).

3.2.10 Defence

There are no defence areas within or in the vicinity of the operational area. The Learmonth Royal Australian Air Force base maintains a restricted airspace area, which overlaps the region.

3.2.11 EPBC Act Listed (Threatened and Migratory) Species and Ecological Communities

A search of the EPBC Act Protected Matters Database was conducted to identify species listed as Threatened and Migratory (Table 3-2) may occur in the operational area and spill EMBAs. The operational area does not intercept any critical habitats important for the survival of listed Threatened species. No listed Threatened Ecological Communities occur within the operational area or spill EMBAs.

The operational area intercepts two Biologically Important Areas (BIA) that extend across much of the NWS:

- Distribution area for the pygmy blue whale (*Balaenoptera musculus brevicauda*). This BIA extends along the entire Western Australian coast and is approximately 100 km wide through the region.
- Foraging (high density) area for the whale shark (*Rhincodon typus*) along the 200 m isobaths northward from Ningaloo.

Table 3-2: EPBC Act listed threatened and migratory marine species within the EMBA

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
Common Name	**Scientific Name**	**CE =** Critically Endangered **E =** Endangered **V =** Vulnerable **M =** Migratory	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**
Marine Mammals								
Blue whale	*Balaenoptera musculus*	E, M	✓	✓	✓	Species or species habitat likely to occur within area. Operational area overlaps with BIA for distribution.	Migration route known to occur within area. EMBA overlaps with BIA for migration & distribution.	Migration route known to occur within area. EMBA overlaps with BIA for migration & distribution.
Fin whale	*Balaenoptera physalus*	V, M	✓	✓	✓	Species or species habitat likely to occur within area.		
Humpback whale	*Megaptera novaeangliae*	V, M	✓	✓	✓	Species or species habitat known to occur within area.	Species or species habitat known to occur within area. EMBA overlaps with BIA for migration.	Species or species habitat known to occur within area.
Sei whale	*Balaenoptera borealis*	V, M	✓	✓	✓	Species or species habitat likely to occur within area.		
Bryde's whale	*Balaenoptera edeni*	M	✓	✓	✓	Species or species habitat likely to occur within area.		
Orca, killer whale	*Orcinus orca*	M	✓	✓	✓	Species or species habitat may occur within area.		
Sperm whale	*Physeter macrocephalus*	M	✓	✓	✓	Species or species habitat may occur within area.		
Spotted bottlenose dolphin	*Tursiops aduncus* (Arafura/Timor Sea populations)	M	✓	✓	✓	Species or species habitat may occur within area.		

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
Common Name	**Scientific Name**	**CE =** Critically Endangered **E =** Endangered **V =** Vulnerable **M =** Migratory	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**
Southern right whale	*Eubalaena australis*	E, M	x	x	✓	N/A	N/A	Species or species habitat likely to occur within area.
Indo-Pacific humpback dolphin	*Sousa chinensis*	M	x	x	✓	N/A	N/A	Species or species habitat known to occur within area.
Dugong	*Dugong dugon*	M	x	x	✓	N/A	N/A	Species or species habitat known to occur within area. Breeding known to occur within area
Fish, Sharks and Rays								
White shark, great white shark	*Carcharodon carcharias*	V, M	✓	✓	✓	Species or species habitat may occur within area.		
Green sawfish	*Pristis zijsron*	V, M	✓	✓	✓	Species or species habitat known to occur within area.		Species or species habitat known to occur within area. Breeding known to occur within area.
Whale shark	*Rhincodon typus*	V, M	✓	✓	✓	Foraging, feeding or related behaviour known to occur within area. Operational area overlaps with BIA for foraging. AMBA overlaps with BIA for foraging.		

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
Common Name	**Scientific Name**	**CE =** Critically Endangered **E =** Endangered **V =** Vulnerable **M =** Migratory	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**
Dwarf sawfish	*Pristis clavata*	V, M	x	✓	✓	N/A	Species or species habitat known to occur within area.	Species or species habitat known to occur within area. Breeding known to occur within area.
Grey nurse shark (west coast popn.)	*Carcharias taurus*	V	x	✓	✓	N/A	Species or species habitat known to occur within area.	
Narrow sawfish	*Anoxypristis cuspidata*	M	✓	✓	✓	Species or species habitat known to occur within area.		
Shortfin mako	*Isus oxyrinchus*	M	✓	✓	✓	Species or species habitat likely to occur within area.		
Longfin mako	*Isurus paucus*	M	✓	✓	✓	Species or species habitat likely to occur within area.		
Reef manta ray	*Manta alfredi*	M	✓	✓	✓	Species or species habitat likely to occur within area.	Species or species habitat known to occur within area.	Species or species habitat likely to occur within area.
Giant manta ray	*Manta birostris*	M	✓	✓	✓	Species or species habitat likely to occur within area.		
Porbeagle, Mackerel shark	*Lamna nasus*	M	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
Marine Reptiles								

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
Common Name	**Scientific Name**	**CE =** Critically Endangered **E =** Endangered **V =** Vulnerable **M =** Migratory	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**
Flatback turtle	*Natator depressus*	V, M	✓	✓	✓	Species or species habitat likely to occur within area	Congregation or aggregation known to occur within area. EMBA overlaps with interesting critical habitat buffer (60 km of Montebello Grp); Oct-Mar.	Congregation or aggregation known to occur within area. Foraging, feeding or related behaviour known to occur within area. Breeding known to occur within area. BIAs and critical habitat present.
Green turtle	*Chelonia mydas*	V, M	✓	✓	✓	Species or species habitat likely to occur within area	Species or species habitat known to occur within area. EMBA overlaps with interesting critical habitat buffer (20 km of Montebello Grp); Nov-Mar.	Species or species habitat likely to occur within area. Foraging, feeding or related behaviour known to occur within area. Breeding known to occur within area. BIAs and critical habitat present.
Hawksbill turtle	*Eretmochelys imbricata*	V, M	✓	✓	✓	Species or species habitat likely to occur within area	Species or species habitat know to occur within area. EMBA overlaps with interesting critical	Species or species habitat likely to occur within area. Foraging, feeding or related behaviour known to

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
Common Name	**Scientific Name**	**CE =** Critically Endangered **E =** Endangered **V =** Vulnerable **M =** Migratory	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**
							habitat buffer (20 km of Montebello Grp); Oct-Feb.	occur within area. Breeding known to occur within area. BIAs and critical habitat present.
Leatherback turtle	*Dermochelys coriacea*	E, M	✓	✓	✓	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area.	Species or species habitat known to occur within area Foraging, feeding or related behaviour known to occur within area. Breeding likely to occur within area.
Loggerhead turtle	*Caretta caretta*	E, M	✓	✓	✓	Species or species habitat likely to occur within area.	Species or species habitat know to occur within area.	Species or species habitat likely to occur within area. Breeding known to occur within area. BIAs and critical habitat present.
Short-nosed seasnake	*Aipysurus apraefrontalis*	CE	x	✓	✓	N/A	Species or species habitat known to occur within area.	
Olive Ridley turtle	*Lepidochelys olivacea*	E, M	x	x	✓	N/A	N/A	Species or species habitat likely to occur within area.

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
Common Name	**Scientific Name**	**CE =** Critically Endangered **E =** Endangered **V =** Vulnerable **M =** Migratory	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**	**Operational Area**	**Diesel Spill**	**Crude Oil Spill**
Marine Birds								
Red knot	*Calidris canutus*	E, M	✓	✓	✓	Species or species habitat known to occur within area.		
Eastern curlew	*Numenius madagascariensis*	CE, M	✓	✓	✓	Species or species habitat known to occur within area.		
Curlew sandpiper	*Calidris ferruginea*	CE, M	x	✓	✓	N/A	Species or species habitat known to occur within area.	
Southern giant petrel	*Macronectes giganteus*	E, M	x	✓	✓	N/A	Species or species habitat may occur within area.	
Australian fairy tern	*Sternula nereis nereis*	V	x	✓	✓	N/A	Foraging, feeding or related behaviour likely to occur within area.	Breeding known to occur within area. Foraging, feeding or related behaviour likely to occur within area. BIAs present.
Great knot	*Calidris tenuirostris*	CE, M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Bar-tailed godwit (baueri)	*Limosa lapponica baueri*	V	x	x	✓	N/A	N/A	Species or species habitat known to occur within area.
Northern Siberian bar-tailed godwit	*Limosa lapponica menzbieri*	CE	x	x	✓	N/A	N/A	Species or species habitat known to occur within area.

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Northern giant petrel	*Macronectes halli*	V, M	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
Soft-plumaged petrel	*Pterodroma mollis*	V	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
Shy albatross	*Thalassarche cauta cauta*	V, M	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
White-capped albatross	*Thalassarche cauta steadi*	V, M	x	x	✓	N/A	N/A	Species or species habitat may occur within area. Foraging, feeding or related behaviour likely to occur within area.
Campbell albatross	*Thalassarche impavida*	V, M	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
Black-browed albatross	*Thalassarche melanophris*	V, M	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
Indian yellow-nosed albatross	*Thalassarche carteri*	V, M	x	x	✓	N/A	N/A	Foraging, feeding or related behaviour

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
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								likely to occur within area.
Abbott's booby	*Papasula abbotti*	E	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
Greater sand plover	*Charadrius leschenaultii*	V, M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Lesser sand plover	*Charadrius mongolus*	E, M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Australian painted snipe	*Rostratula australis*	E	x	x	✓	N/A	N/A	Species or species habitat may occur within area.
Common noddy	*Anous stolidus*	M	✓	✓	✓	Species or species habitat may occur within area.		
Streaked shearwater	*Calonectris leucomelas*	M	✓	✓	✓	Species or species habitat likely to occur within area.		
Lesser frigatebird	*Fregata ariel*	M	✓	✓	✓	Species or species habitat likely to occur within area.		
Great frigatebird	*Fregata minor*	M	✓	✓	✓	Species or species habitat may occur within area.		
Common sandpiper	*Actitis hypoleucos*	M	✓	✓	✓	Species or species habitat may occur within area.		
Sharp-tailed sandpiper	*Calidris acuminata*	M	✓	✓	✓	Species or species habitat may occur within area.		

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Pectoral sandpiper	*Calidris melanotos*	M	✓	✓	✓	Species or species habitat may occur within area.		
Osprey	*Pandion haliaetus*	M	✓	✓	✓	Species or species habitat may occur within area.	Species or species habitat may occur within area.	Species or species habitat may occur within area. Breeding known to occur within area.
Bar-tailed godwit	*Limosa lapponica*	M	x	x	✓	N/A	N/A	Species or species habitat known to occur within area.
Wedge-tailed shearwater	*Ardenna pacifica*	M	x	x	✓	N/A	N/A	Breeding known to occur in the area. BIAs present.
Flesh-footed shearwater	*Ardenna carneipes*	M	x	x	✓	N/A	N/A	Species or species habitat likely to occur within area.
Terek sandpiper	*Xenus cinerus*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Broad-billed sandpiper	*Limicola falcinellus*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Red-necked stint	*Calidris ruficollis*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
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Marsh sandpiper	*Tringa stagnatilis*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Sanderling	*Calidris alba*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Common redshank	*Tringa totanus*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Caspian tern	*Hydroprogne caspia*	M	x	x	✓	N/A	N/A	Breeding known to occur within area. Foraging, feeding or related behaviour known to occur within area.
Bridled tern	*Onychoprion anaethetus*	M	x	x	✓	N/A	N/A	Breeding known to occur within area.
Roseate tern	*Sterna dougallii*	M	x	x	✓	N/A	N/A	Breeding known to occur within area. Foraging, feeding or related behaviour likely to occur within area. BIAs present.
Crested tern	*Thalasseus bergii*	M	x	x	✓	N/A	N/A	Breeding known to occur within area.

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
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Little tern	*Sternula albifrons*	M	x	x	✓	N/A	N/A	Species or species habitat may occur within area. BIAs present.
Oriental plover	*Charadrius veredus*	M	x	x	✓	N/A	N/A	Species or species habitat may occur within area. Roosting known to occur within area.
Grey plover	*Pluvialis squatarola*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Oriental pratincole	*Glareola maldivarum*	M	x	x	✓	N/A	N/A	Species or species habitat may occur within area. Roosting known to occur within area.
Common greenshank	*Tringa nebularia*	M	x	x	✓	N/A	N/A	Species or species habitat known to occur within area.
Ruddy turnstone	*Arenaria interpres*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Grey-tailed tattler	*Tringa brevipes*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.

Value/ Sensitivity		EPBC Act Status	Presence			Type of Presence and Occurrence of Important/Critical Habitat		
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Pin-tailed snipe	*Gallinago stenura*	M	x	x	✓	N/A	N/A	Roosting likely to occur within area.
Swinhoe's snipe	*Gallinago megala*	M	x	x	✓	N/A	N/A	Roosting likely to occur within area.
Asian dowitcher	*Limnodromus semipalmatus*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Little curlew	*Numenius minutus*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Whimbrel	*Numenius* phaeopus	M	x	x	✓	N/A	N/A	Roosting known to occur within area.
Ruff	*Philomachus pugnax*	M	x	x	✓	N/A	N/A	Roosting known to occur within area.

4 STAKEHOLDER CONSULTATION

4.1 Summary

Santos is committed to consulting with relevant stakeholders to ensure concerns associated with the Mutineer Exeter Development are incorporated into the management of the Activity wherever practicable.

Santos has been actively involved in stakeholder engagement in the Dampier region since the initial development of the Mutineer Exeter production facility in 2005. The Mutineer Exeter Development initiated the long-term relationship between Santos and relevant stakeholders such as commercial and recreational fisheries, conservation organisations, recreational organisations, non-government organisations, and government agencies.

This relationship has continued throughout the drilling, construction and production phases and now the consultation process for the CoP EP. Although there are no new or different significant risks or impacts associated with the activities covered by the CoP EP, the stakeholder engagement process supporting the EP addressed all relevant stakeholders.

4.2 Stakeholder Consultation Objectives

The principal objectives of consultation undertaken for the CoP EP are:

- Confirm relevant stakeholders.
- Continue to maintain open communications between relevant stakeholders and Santos.
- Continue to implement stakeholder engagement tools for the CoP phase communications.
- Proactively seek agreement with relevant stakeholders on recommended strategies to minimise negative impacts and maximise positive impacts of the activity.
- Provide a means for recording initiatives in which communication and/or consultation is undertaken, issues raised and responses recorded.

4.3 CoP EP Consultation

Stakeholder consultation has been guided by the following:

- NOPSEMA Decision-Making Guideline – Criterion-10A(g) Consultation Requirements
- APPEA Stakeholder Consultation and Engagement Principles and Methodology - Draft

For the consultation process Santos has used the requirements in the OPGGS(E)R in regards to a relevant person. Relevant stakeholders are identified in Table 4-1 and a summary of the consultation undertaken and associated outcomes is provided in Table 4-2. Section 4.5 details the ongoing consultation that will be undertaken.

Table 4-1: Assessment of Stakeholders

Stakeholder	Relevant to EP	Reasoning
Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant		
Australian Fishing Management Authority (AFMA)	✓	Manage Commonwealth fisheries.
Australian Maritime Safety Authority (AMSA)	✓	AMSA is the statutory and control agency for vessel safety and navigation in Commonwealth waters.
Australian Hydrographic Service (AHS)	✓	Responsible for Notice to Mariners.
Marine Border Control (MBC)	x	Responsible for coordinating offshore maritime security.
Department of Defence (DoD)	x	ME Development is outside area of military activity.
Department of Environment and Energy (DoEE)	✓	As the DoEE's functions, interests and activities have been incorporated in the requirements of the Program, the DoEE is not considered a relevant agency for consultation purposes under the OPGGS(E)R.
Director of National Parks (DNP)	✓	Responsible for managing proclaimed marine parks.
National Offshore Petroleum Safety Environment Management Authority (NOPSEMA)	✓	Statutory authority for offshore petroleum activities. Consultation prior to EP submission is not required.
Department or agency of the State or the Territory to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant and the Department of the responsible State Minister		
Department of Primary Industries and Regional Development (DPIRD) - Fisheries Division	✓	Manages State fisheries.
WA Department of Transport (DoT)	✓	Control agency for marine pollution emergencies with potential to impact State waters. DoT Offshore Petroleum Industry Guidance Note Marine Oil Pollution: Response and Consultation Arrangements (Dec 2017) Section 10.1 requires petroleum titleholders to consult with DoT for activities that have the potential to cause a marine pollution emergency in State Waters. Consultation required as modelling of the worst-case crude spills predict oil may enter into State Waters and contact shorelines. Santos provided DoT with a copy of the OPEP for comment, and subsequently Santos has responded to DoT's comments on the OPEP. Consultation with DoT is ongoing.
Department of the responsible State Minister		

Stakeholder	Relevant to EP	Reasoning
Department of Mines, Industry Regulation and Safety (DMIRS)	✓	Consultation required as per DMP Consultation Guidance Note (For the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009). Section 1.1 Ongoing Consultation includes Cessation activity pre-start notification and Decommissioning consultation.
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		
Western Australian Fishing Industry Council (WAFIC)	✓	Members potentially fish in or near the permit areas.
Commonwealth Fishing Association (CFA)	✓	Members potentially fish in or near the permit areas.
RecFish West	✓	Represent recreational fishers.
Western Skipjack Tuna Fishery – Cth	x	Advised by WAFIC that this is an inactive fishery. Based on this information Western Skipjack Tuna Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
North West Slope Trawl Fishery – Cth	x	Advised by WAFIC that this is an inactive fishery. Based on this information North West Slope Trawl Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
Western Tuna and Billfish Fishery – Cth (Uptop Fisheries / Ocean Wild Tuna)	✓	Potentially active in the permit area
Beche de mer Fishery	x	Advised by WAFIC as not active in the permit area as this is a wading/ shallow dive fishery. Based on this information Beche de mer Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
Kimberley Gillnet and Barramundi Managed Fishery	x	Advised by WAFIC as not active in the permit area as these are Kimberley fisheries. Based on this information Kimberley Gillnet and Barramundi Managed Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
Onslow Prawn Fishery	x	Advised by WAFIC as not active in the permit area as they do not operate at distance from the coast. Based on this information Onslow Prawn Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
Nickol Bay Prawn Fishery	x	Advised by WAFIC as not active in the permit area as they do not operate at distance from the coast. Based on this information Nickol Bay Prawn Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
Northern Shark Fishery	x	Advised by WAFIC that the state managed Northern Shark Fishery is not active in the permit areas. AMFA website indicates fishery has been closed since 2009. Based on this information Northern Shark Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
Pearl Oyster Fishery (Zone 1)	✓	Advised by WAFIC to consult with Pearl Producers Association.

Stakeholder	Relevant to EP	Reasoning
Pearl Producers Association	✓	Advised by WAFIC as representing the Pearl Oyster Fishery.
Statewide Large Pelagic Finfish Resource	✓	Advised by WAFIC as potentially active in the permit areas. Commercially the resource is predominantly accessed by the Mackerel Managed Fishery (MMF) in the North Coast Bioregion (Area 2 – Pilbara).
Pilbara Trawl, Trap and Line Fishery	✓	Advised by WAFIC that the Pilbara Trawl, Trap and Line Fishery may be active in the permit areas.
MG Kailis Pty Ltd	✓	Potentially active in the permit areas.
EA Morrision and SD Bransby (operated by MG Kailis Pty Ltd)	✓	See consultation records for MG Kailis Pty Ltd
GNTM Pty Ltd (operated by MG Kailis Pty Ltd)	✓	See consultation records for MG Kailis Pty Ltd
Seafresh Holdings / Shark Bay Nominees / Westmore Seafoods	✓	Potentially active in the permit areas.
Coyrecup Lake Pty Ltd / Old Brown Dog Pty Ltd	✓	Potentially active in the permit areas.
Fat marine and Glenn Money	✓	Potentially active in the permit areas.
Robert and Leigh James Mitchell (Fresh Fish Shack)	✓	Potentially active in the permit areas.
RnR Fisheries	✓	Potentially active in the permit areas.
Victor and Marie Filippou	✓	Potentially active in the permit areas.
Robert and Judith Cooper	✓	Potentially active in the permit areas.
Specimen Shell Fishery	x	Advised by WAFIC as not active in the permit area as they do not operate at the water depths. Based on this information the Specimen Shell Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
West Coast Deep Sea Crustacean	x	Advised by WAFIC that the fishery operates in water depths greater than 300 m. Based on this information the West Coast Deep Sea Crustacean Fishery was assessed as not being a relevant stakeholder for the Cessation of Production EP.
Southern Blue Fin Tuna Fishery	x	No southern blue fin tuna fishing in WA.
Mareterram Fisheries Pty Ltd	✓	Potentially active in the permit areas.
Haydn Lancelot Webb / Haysito Holdings	✓	Potentially active in the permit areas.

Stakeholder	Relevant to EP	Reasoning
Any other person or organisation that the titleholder considers relevant.		
Australian Marine Oil Spill Centre (AMOSC)	✓	Santos is a participating member of AMOSC. In the event of an oil spill, AMOSC would provide equipment and support. Ongoing Consultation (refer to Section 4.5) includes requirement to submit accepted OPEP to AMOSC.
Oil Spill Response Limited (OSRL)	✓	Santos has a contract with OSRL. In the event of an oil spill, OSRL may provide equipment and support.
Woodside Energy Ltd	✓	The closest facility to the ME Development is Woodside's unmanned Angel platform. No new developments or activities are proposed by Woodside in the vicinity of the ME Development.

4.4 Consultation Outcomes

Table 4-2: Summary of Consultation Outcomes

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
Australian Fishing Management Authority (AFMA)	Santos sent AFMA a ME Cessation Stakeholder Consultation Information Sheet on 17.11.12. AFMA confirmed three fisheries have the potential to operate in the area and requested Santos to consult further with the Commonwealth Fisheries Association.	No unresolved objections or claims made.	Santos has consulted with CFA (see below).
Australian Maritime Safety Authority (AMSA)	Santos sent AMSA a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. AMSA advised that as Cessation activities will take place inside the existing petroleum safety zones there is no need to issue any warnings to mariners. AMSA requested that the AHS is notified at the completion of the Cessation phase for the promulgation of related notices to mariners.	No unresolved objections or claims made.	No response required. The CoP EP includes associated end of activity notification requirements.
Australian Hydrographic Service (AHS)	Santos sent AHS a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. AHS acknowledged receipt of the information sheet and requested to be notified at the completion of the Cessation phase for the promulgation of related notices to mariners as requested by AMSA above. This is detailed in Section 4.5 Ongoing Consultation.	No unresolved objections or claims made.	No response required. The CoP EP includes associated end of activity notification requirements.
Director of National Parks (DNP)	Santos sent DNP a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. Receipt of the information sheet was acknowledged and no further information was requested.	No unresolved objections or claims made.	No response required.

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
Department of Primary Industries and Regional Development (DPIRD) - Fisheries Division	Santos sent DPIRD a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. DPIRD – Fisheries requested Santos: • Progress decommissioning as soon as practicable • Ensure the site is left in a condition that allows trawling and other fishing operations to occur • Consult further during the decommissioning planning stage. No further information was requested by DPIRD – Fisheries during the Cessation Phase and they did not request Santos to undertake any further consultation with particular stakeholders.	No unresolved objections or claims made.	No response required. The CoP EP includes indicative decommissioning timeframes and concurrent removal of Petroleum Safety Zone (PSZ) to allow trawling and other fishing operations to occur as well as a commitment to consult further with DPIRD-Fisheries during the decommissioning planning phase (see Section 4.5 Ongoing Consultation).
WA Department of Transport (DoT) – Oil Spill Response Coordination	Santos sent DoT a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. No response was received. As per the DoT Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (December 2017), Santos provided a copy of the CoP OPEP for review on 23.02.18. DoT provided comments and Santos subsequently responded. Consultation with DoT is ongoing.	No unresolved objections or claims made.	No response required.
Department of Mines, Industry Regulation and Safety (DMIRS)	Santos sent DMIRS a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. DMIRS acknowledged the information sheet and had no comments. DMIRS requested notification once production ceases and to be kept up to date with future decommissioning activities (see Section 4.5 Ongoing Consultation).	No unresolved objections or claims made.	The CoP EP includes associated end of activity notification requirements.
Western Australian Fishing Industry Council (WAFIC)	Santos sent WAFIC a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. Following Santos' consultation with licenced commercial fishers in the area, which resulted in no formal feedback or correspondence being provided by the licence holders, WAFIC was engaged to undertake further consultation with active commercial fishers in the operational area on behalf of Santos to ensure their interests in the Cessation and Decommissioning phases are recorded and considered. WAFIC provided comments to Santos, along with the results of consultation, on 5 February 2018. WAFIC comments focused on cessation and decommissioning, in particular opportunities to expedite the removal of safety exclusion zones and the retention of habitat that may have developed on/around subsea infrastructure. No concerns were raised regarding the activities in the CoP EP.	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Commonwealth Fishing	Santos sent CFA a ME Cessation Stakeholder Consultation Information Sheet on 22.11.17 as requested by AFMA. CFA acknowledged receipt of this email and	No unresolved objections or claims made.	No response required.

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
Association (CFA)	requested Santos to consult with WAFIC. In December 2017, WAFIC commenced engagement on behalf of Santos. Information was sent via email to CFA for the benefit of their member base - no response is required.		Consultation with WAFIC described above.
Australian Southern Bluefin Tuna Association (ASBTIA)	Santos sent WAFIC a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. On behalf of Santos, WAFIC engaged with ASBTIA via email with follow up consultation via email and/ or telephone. ASBTIA responded stating they will keep the information on file for their members. They enquired if they needed to formally respond to Santos. They also asked who is responsible for ongoing monitoring of decommissioned sites and for how long? WAFIC advised ASBTIA that third parties can conduct stakeholder consultation on behalf of proponents. Santos advised that after the ME wells are plugged and abandoned during final decommissioning, the production licences WA-54-L, WA-26-L and WA-27-L will be terminated. The area would still fall within the exploration permit WA-191-P title. Santos, Kufpec and JX Nippon, as the current Joint Venture Partners of this exploration permit, would still be responsible for the decommissioned site. Any further queries regarding ongoing responsibility will be addressed as part of consultation during the decommissioning planning phase.	No unresolved objections or claims made.	No response required
Western Tuna and Billfish Fishery – Cth (Uptop Fisheries/Ocean Wild Tuna)	As requested by the CFA, WAFIC commenced consultation with Western Tuna and Billfish Fishery on behalf of Santos in December 2017. Information was sent to Uptop Fisheries / Ocean Wild Tuna via email with follow-up contact via email and telephone. Response was focused on the Cessation and Decommissioning phases, including a request to be consulted during decommissioning phase, for retention of 'as much natural environment around the ME development and to see, as soon as possible, that exclusion zones are removed.' Also queried 'how high above the seabed is the remaining subsea infrastructure and once the FPSO has departed, how high above the seabed will the remaining anchor system be?' Santos responded: 'the subsea production system and manifolds are less than 10 m above the seabed. The mooring system will remain in-situ during the cessation phase. The buoy at the top of the mooring system will be lowered to 30 m below the sea surface.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
RecFish West	Santos sent RecFish West a ME Cessation Stakeholder Consultation Information Sheet on 21.11.17. Although ME is out of reach of recreational fishers, RecFish West has requested that Santos consult with them early in Decommissioning Planning phase to assess opportunities to repurpose the remaining infrastructure, such as the turret mooring, to form new fishing habitat either *in situ* or moved to water closer to the coast to create fish habitat for recreational fishers (see Section 4.5 Ongoing Consultation).	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
			infrastructure and associated exclusion zones.
Pearl Oyster Fishery	Advised by WAFIC to consult with the Pearl Producers Association (PPA). In December 2017 WAFIC commenced engagement on behalf of Santos. Information was sent via email to the PPA. Follow-up consultation was via telephone and email and the following response received: 'although the operational area is located in Zone 1 of the Pearl Oyster Managed Fishery, the water depths are beyond the fisheries operating depths, so of little interest to industry.' Further comments were made regarding eventual decommissioning 'we are keen to see the oil and gas sector working to retain as much of the natural habitat as possible for the overall enhancement of the marine environment. The PPA is opposed to the complete removal of the established environment, breeding and feeding areas which have grown around subsea infrastructure.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
State-wide Large Pelagic Finfish Resource	Commercially the resource in this fishery is predominantly accessed by the Mackerel Managed Fishery (MMF) in the North Coast Bioregion (Area 2 – Pilbara). Consultation with fishers in the MMF provided below.	No unresolved objections or claims made.	No response required.
Pilbara Trawl, Trap and Line Fishery	Advised by WAFIC that the Pilbara Trawl, Trap and Line Fishery may be active in the permit area. Consultation with individual licence holders in this fishery via WAFIC is summarised below.	No unresolved objections or claims made.	No response required.
MG Kailis Pty Ltd (Pilbara Line and Trawl Fishery)	Santos phoned the licence holder and sent a ME Cessation Stakeholder Consultation Information Sheet on 24.11.17. Licence holder confirmed that Kailis is a relevant stakeholder as they fish in the vicinity of the ME Development. No issues were raised regarding the activities to be undertaken under the EP Addendum on the phone call. No acknowledgement of the Information Sheet was received. In December 2017, WAFIC re-engaged with this licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'Kailis vessels in the Pilbara Trawl Fishery operated in water depths between ~60-120 m.' Further comments were made regarding eventual cessation and decommissioning activities: 'keen to see as much natural environment/habitat retained around the ME development, and to see, as soon as possible, that exclusion zones are removed. Any potential hazards to be marked on charts.' Requested to be consulted during decommissioning phase, 'keen to see as much healthy habitat kept as possible'.	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
EA Morrision and SD Bransby (Pilbara Trawl Fishery)	In December 2017, WAFIC engaged with this licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholders response as follows: 'Pilbara Trawl Fishery operates in water depths between 50-100 m.'	No unresolved objections or claims made.	No response required.

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
	Further comments were made regarding eventual cessation and decommissioning activities: 'keen to see as much natural environment/habitat retained around the ME development, and to see exclusion zones removed to enable easier movement, general vessel transiting of area and access by other commercial fishers. Any potential hazards to be marked on charts.'		
GNTM Pty Ltd (operated by MG Kailis Pty Ltd)	See consultation records for MG Kailis Pty Ltd.	No unresolved objections or claims made.	No response required.
Seafresh Holdings Pty Ltd Westmore Seafoods (Pilbara Trap & Trawl Fishery)	Santos emailed this licence holder a ME Cessation Stakeholder Consultation Information Sheet on 24.11.17. No acknowledgement of the Information Sheet was received. In December 2017, WAFIC re-engaged with this licence holder on behalf of Santos as described above. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'Westmore vessels in the Pilbara Trawl Fishery currently operate in water depths between ~60-120 m. This fishing depth range may change in the future. Keen to see as much natural environment/habitat retained around the ME development, noting potential future use in both Trawl and Trap fisheries and overall environmental enhancement. Keen to see, as soon as possible, that exclusion zones are removed. Any potential hazards to be marked on charts.' Requested to be consulted during decommissioning phase.	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Old Brown Dog Pty Ltd (Pilbara Trap)	Santos left a voice message with this licence holder and sent a ME Cessation Stakeholder Consultation Information Sheet on 24.11.17. No acknowledgement of the Information Sheet was received. In December 2017, WAFIC re-engaged with this licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'keen to see as much natural environment/ habitat retained around the ME development, and to see exclusion zones are removed. Any potential hazards to be marked on charts.' Requested to be consulted during decommissioning stage.	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Fat Marine and Glenn Money (Pilbara Line Fishery)	Santos phoned the licence holder and sent a ME Cessation Stakeholder Consultation Information Sheet on 24.11.17. No issues were raised regarding the activities to be undertaken under the EP Addendum in the phone call. No acknowledgement of the Information Sheet was received. In December 2017, WAFIC re-engaged with this licence holder on behalf of Santos as described above. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'keen to see as much natural environment retained around the ME development, and to see, as soon as possible, that exclusion zones are removed. Keen to be consulted with during	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
	decommissioning phase; keen to see as much healthy habitat kept as possible. Noting this area has been inaccessible to commercial fishers for many years, important to get ongoing benefit from the previous years of exclusion from the site.'		
Fresh Fish Shack (Mackerel Managed Fishery Area 2, Pilbara Line Fishery)	Santos phoned this licence holder and sent a ME Cessation Stakeholder Consultation Information Sheet on 24.11.17. The licence holder said that the well heads would provide good fishing ground and was frustrated that the PSZ would remain in place for the cessation phase. Santos explained that it will remain in place as a safety measure. No additional issues were raised regarding the activities to be undertaken under CoP EP on the phone call. No acknowledgement of the Information Sheet was received. In December 2017, WAFIC re-engaged with licence holder on behalf of Santos as described above. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'keen to see as much natural environment retained around the ME development, and to see, as soon as possible, that exclusion zones are removed, if safe to do so. During decommissioning phase, keen to see as much healthy habitat kept as possible.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
RnR Fisheries (Mackerel Managed Fishery Area 2, Pilbara Line Fishery)	Santos sent this licence holder a ME Cessation Stakeholder Consultation Information Sheet on 24.11.17. No acknowledgement of the Information Sheet was received. In December 2017, WAFIC re-engaged with licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'keen to see as much natural environment retained around the ME development, and to see, as soon as possible, that exclusion zones are removed. During decommissioning phase, keen to see as much healthy habitat kept as possible.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Haydn Lancelot Webb (Mackerel Managed Fishery Area 2; Pilbara Line Fishery)	In December 2017, WAFIC commenced engagement with licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'water depths unsuitable for mackerel fishing. Would like to see oil and gas cessation and eventual decommissioning retaining the natural habitats which have formed around the base of the structures over the years of operations are retained as aggregation/ spawning/ feeding etc sites, Opposed to the complete removal of these habitats. Seeks exclusion zones being removed at the earliest possible time.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Mareterram Fisheries Pty Ltd (Mackerel Managed Fishery Area 2)	In December 2017, WAFIC commenced engagement with licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'keen to see as much natural environment retained around the ME development, and to see, as soon as possible, that exclusion zones are removed. During decommissioning phase, keen to see as much healthy habitat kept as possible.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
			for dealing with field infrastructure and associated exclusion zones.
Robert and Judith Cooper (Mackerel Managed Fishery Area 2)	In December 2017, WAFIC commenced engagement with licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'keen to see as much natural environment retained around the ME development, and to see, as soon as possible, that exclusion zones are removed. During decommissioning phase, keen to see as much healthy habitat kept as possible.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Victor and Marie Filippou (Mackerel Managed Fishery Area 2; Pilbara Line Fishery)	In December 2017, WAFIC commenced engagement with licence holder on behalf of Santos. Information was sent via email with follow-up contact via email and telephone. WAFIC summarised the stakeholder's response as follows: 'keen to see as much natural environment retained around the ME development, and to see, as soon as possible, that exclusion zones are removed. During decommissioning phase, keen to see as much healthy habitat kept as possible.'	No unresolved objections or claims made.	No response required. The CoP EP (as will the Decommissioning EP) includes consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Woodside Energy Ltd	Santos called Woodside spokesperson and sent Woodside a ME Cessation Stakeholder Consultation Information Sheet on 10.12.17. No requests for further information have been received.	No unresolved objections or claims made.	No response required.

4.5 Ongoing Stakeholder Consultation

From the stakeholder consultation undertaken and documented in Table 4-2 the following notifications and ongoing consultation will be undertaken.

- Notify Australian Hydrographic Service a minimum of 3 weeks prior to the commencement of inspection/maintenance campaigns.
- Notify DMIRS of cessation of production activity and consult during Decommissioning planning.
- Send AMOSC a copy of the NOPSEMA-accepted CoP OPEP and notify of when inspection/maintenance campaigns start and finish.
- Continue to consult with DoT (Hazard Management Authority) and send a copy of the NOPSEMA-accepted CoP OPEP.
- Continue to consult with Woodside as the operator of Angel Platform, the closest asset to the ME Development.
- Notify AHS 4 weeks prior to the end of the Cessation phase for the promulgation of related notices to mariners.

Based on historic data of commercial fisheries in the operational area, over the 5 years that the EP will cover, there is unlikely to be any change in the current low level of fishing activities. However, Santos will continue to engage with DPIRD – Fisheries Division and RecFish West and consult with them early in the decommissioning planning phase to ensure its preferred decommissioning outcomes are considered.

In addition to the ongoing consultation requirements above, prior to any offshore campaigns taking place, Santos will review relevant stakeholders as per the Mutineer Exeter Stakeholder Review Process. If any changes to relevant stakeholders are identified Santos will consult with them prior to the campaign taking place.

Santos will assess any feedback received, including any future stakeholder objections or claims about the proposed Activity, and take appropriate action where it considers it necessary to do so, which may include amendment to the CoP EP. Santos will advise stakeholders of its response to the feedback provided and any resultant action taken.

If an additional control measure, or change to an existing control measure, is considered necessary as an outcome of stakeholder feedback, this will be managed as per Santos' Management of Change (MoC) process and in accordance with regulatory requirements.

5 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

Santos has undertaken an environmental impact and risk assessment for the planned activity in accordance with the OPGGS(E)R. This section describes the environmental impact and risk assessment methods applied.

The assessment results are presented in Section 6.

The environmental risk assessment process undertaken for the planned activity comprised the following components:

1. Identification of environmental hazards
2. Identification of the area that may be effected
3. Description of the environment that may be affected
4. Identification of the particular values and sensitivities
5. Identification and evaluation of potential environmental impacts
6. Control measure identification and ALARP decision framework
7. Determine severity of consequence
8. Determine likelihood (for unplanned events)
9. Determine residual risk ranking
10. Determination of acceptability

The outcome of the risk assessment process is detailed in Section 6.

5.1 Identification of Environmental Hazards (Aspects)

Environmental hazards or aspects are those elements of the activity that can interact with the environment. Environmental hazards were identified for operations and emergency conditions. An assessment of each component of the activity was undertaken and the environmental hazards (aspects) identified.

5.2 Identification of the Area that may be Affected

Following the identification of environmental hazards, the likely extent of each hazard, the area that may be affected was determined. Based on the risk assessment undertaken, the area that may be affected for planned events was determined to fall within the operational area, whereas the area that may be affected for unplanned events was determined by modelling of the worst-case spill scenarios.

5.3 Description of Environment that may be Affected

The environment that may be affected (EMBA) was then described. Section 3 describes the existing environment within this area, including any relevant cultural, social and economic aspects.

5.4 Identification of Particular Values and Sensitivities

Based on Santos' and publicly available information a review of the existing environment was undertaken to identify the environmental values and / or sensitivities with the potential to occur within the EMBA. Section 3 provides a summary of these values and sensitivities. These were used to inform the risk assessment as they provide the potential worst-case consequence.

5.5 Identification and Evaluation of Potential Environmental Impacts

Based on Santos' and publicly available information, the known and potential impacts to the identified receptors were identified. These were then evaluated and specifically considered:

- Receptor sensitivity to identified hazard
- Extent and duration of the potential impact.

5.6 Control Measure Identification and ALARP Decision Framework

Based upon the identified assessment technique used to demonstrate ALARP, control measures were identified in accordance with the defined environmental performance outcomes, to eliminate, prevent, reduce or mitigate consequences associated with each of the identified environmental impacts.

5.6.1 ALARP Decision Framework

In alignment with NOPSEMA's ALARP Guidance Note (GN0166), Santos have adapted the approach developed by Oil and Gas UK (OGUK) (formerly UKOOA) for use in an environmental context to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP (Figure 5-1). Specifically, the framework considers impact severity and several guiding factors:

- Activity type;
- 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 outlined in Table 5-1.

Figure 5-1: Impact and Risk 'Uncertainty' Decision Making Framework

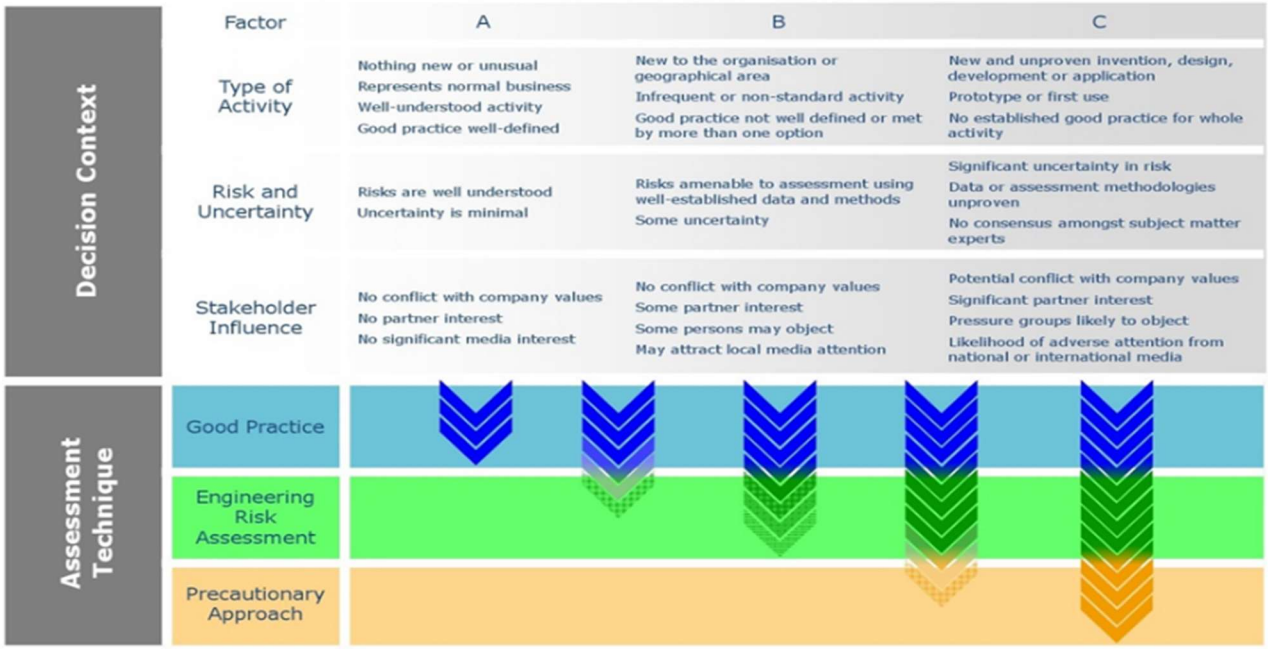

Table 5-1: ALARP Decision-Making based upon Level of Uncertainty

Decision Type	Description	Decision Making Tools
A	Risks classified as a Decision Type A are well-understood and established practice.	Good Practice Control Measures are considered to be: Legislation, codes and standards: Identifies the requirements of legislation, codes and standards that are to be complied with for the activity. Good Industry Practice: Identifies further engineering control standards and guidelines that may be applied over and above that required to meet the legislation, codes and standards. Professional Judgement: Uses relevant personnel with the knowledge and experience to identify alternative controls. When formulating control measures for each environmental impact or risk, the 'Hierarchy of Controls' philosophy, which is a system used in the industry to identify effective controls to minimise or eliminate exposure to impacts or risks, is applied.
B	Risks classified as a Decision Type B are typically in areas of increased environmental sensitivity with some stakeholder concerns.	Risk-based tools such as cost based analysis or modelling: Assesses the results of probabilistic analyses such as modelling, quantitative risk assessment and/or cost benefit analysis to support the selection of control measures identified during the risk assessment process.
C	Risks classified as a Decision Type C will typically involve sufficient complexity, high potential impact, uncertainty or stakeholder interest.	Precautionary Approach: OGUK (2014) state that if the assessment, taking account of all available engineering and scientific evidence, is insufficient, inconclusive or uncertain, then a precautionary approach to hazard management is needed. A precautionary approach will mean that uncertain analysis is replaced by conservative assumptions that will result in control measures being more likely to be implemented.

5.6.2 Control Measure Identification

Control measures were identified for each hazard with the aim of eliminating the hazard, or if this was not reasonably practicable, to minimise the risk to as low as reasonably practicable (ALARP). The process of identifying control measures is an iterative process of:

- Identifying a risk control
- Assessing the risk control
- Deciding whether residual risk levels are tolerable
- If not tolerable, identifying a new risk control
- Assessing the effectiveness of that control

Santos uses a hierarchy of control (Table 5-2) where you start at the top of the list and ask "Is there any reasonably practicable way that we can eliminate the hazard?" If the answer is yes then this is the most effective way of managing the hazard. If the answer is no then you move down to the next option in the list. This process of working down the list is repeated until a control measure/s can be found.

Once the control measures were determined performance outcomes, performance standards and measurement criteria were established. Terms used for measuring the environmental performance for each hazard are 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 statement of the measurable level of performance required for the management if environmental aspects of an activity to ensure that the environmental impacts and risks will be of an acceptable level.
- *Performance standard* – 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.

Table 5-2: Santos Hierarchy of Control

Control	Effectiveness	Example
Eliminate		*Removal of the risk.* Refueling of vessels at port eliminates the risks of an offshore refuelling.
Substitute		*Change the risk for a lower one.* The use of low-toxicity chemicals that perform the same task as a more toxic additive.
Engineering		*Engineer out the risk.* The use of oil-in-water separator to minimise the volume of oil discharged.
Isolation		*Isolate people or the environment from the risk.* The use of bunding for containment of bulk liquid materials.
Administrative		*Provide instructions or training to people to lower the risk.* The use of Job Hazard Analysis to assess and minimise the environmental risks of an activity.
Protective		*Use of protective equipment.* Containment and recovery of spilt hydrocarbons.

5.7 Determination of Severity of Consequence

Once the potential hazards and receptors were identified the potential level of impact (consequence) was assessed and assigned. Consequence is defined using the Santos Environmental Consequence Classification Guide (Table 5-3). The consequence level for each hazard is documented in the risk assessment tables in Section 6.

Table 5-3: Santos Environmental Consequence Classification

Consequence Classification	Indicative Impact		
	Ecosystems	**Flora and Fauna Conservation Value**	**Land/Water/Air**
Critical (VI)	Regional and long-term impact on an area of significant environmental value.	Destruction of / or extensive and long-term impact to an important population of plants and animals with recognised conservation value.	Regional and long-term impact to land or surface or groundwater or air quality. Complete remediation impossible.
Severe (V)	Regional and medium-term impact on an area of significant environmental value.	Destruction of an important population of plants and animals of recognised environmental value.	Regional and medium-term impact to land or surface or groundwater or air quality. Complete remediation not practical or impossible.
Major (IV)	Extensive and medium-term impact or localised and long-term impact to areas of significant environmental value. Extensive and medium-term impact or localised and long-term impact to an ecosystem.	Extensive and medium-term impact or localised and long-term impact to plants or animals with recognised conservation value.	Extensive and medium-term impact or localised and long-term impact to land or surface or groundwater or air quality. Remediation possible but may be difficult or expensive.
Moderate (III)	Localised and medium-term impact or extensive and short-term impact to areas of significant environmental value. Localised and medium-term impact or extensive and short-term impact to an ecosystem.	Localised and medium-term impact or extensive and short-term impact to plants or animals of significant environmental value.	Localised and medium-term impact or extensive and short-term impact to land or surface or groundwater or air quality. Remediation may be difficult or expensive.
Minor (II)	Localised and short-term impact to areas of environmental value. Localised and short-term impact to an ecosystem.	Localised and short-term impact to plants or animals with environmental value.	Localised and short-term impact to land or surface or groundwater or air quality. Readily treated.
Negligible (I)	Negligible/localised and short-term impact to an ecosystem/community.	Localised and short-term impact to plants of animals.	Negligible/localised and short-term impact to land or surface or groundwater or air quality. Readily treated.

Definitions	
Duration of Potential Impact	**Extent of Impact**
Short-term: Days or weeks	**Localised:** Within the operational area
Medium-term: Less than 12 months	**Extensive:** Within the EMBA
Long-term: Greater than 12 months	**Regional:** Outside of the EMBA

For planned events covered by the EP, the final ranking directly reflects the consequence level assigned by evaluation of impacts as shown in Table 5-4.

Table 5-4: Planned Event Ranking

Impact Consequence Ranking	Final Ranking (for planned events)	Treatment Guide
Critical (VI)	Very High (5)	Intolerable
Severe (V)	Very High (5)	
Major (IV)	High (4)	May Be Tolerable Subject to ALARP
Moderate (III)	Medium (3)	
Minor (II)	Low (2)	
Negligible (I)	Very Low (1)	Tolerable

5.8 Determination of Likelihood

For unplanned risks, a likelihood evaluation is also undertaken. Likelihood is defined as the likelihood of the consequence occurring, this includes the likelihood of the event occurring and the subsequent likelihood of the consequence occurring. Likelihood is defined using the Santos Likelihood Descriptors (Table 5-5) from the Santos Operational Risk Matrix.

Table 5-5: Santos Likelihood Descriptors

Level		Criteria
Almost Certain	**f**	Occurs in almost all circumstances or could occur within days to weeks
Likely	**e**	Occurs in most circumstances or could occur within weeks to months
Occasional	**d**	Has occurred before in Santos or could occur within months to years
Possible	**c**	Has occurred before in the industry or could occur within the next few years
Unlikely	**b**	Has occurred elsewhere or could occur within decades
Remote	**a**	Requires exceptional circumstances and is unlikely even in the long term or only occurs as a “100 year event”

5.9 Residual Risk Ranking

Risk is expressed in terms of a combination of the consequence of an impact and the likelihood of the consequence occurring. Santos uses a Corporate Risk Matrix (Table 5-6) to plot the consequence and likelihood to determine the level of risk.

Once the level of risk is determined, Santos uses a Risk Significance Rating (Table 5-7) to determine the magnitude of the risk and if further action is required to reduce the level of risk using the process described in Section 5.6.

Table 5-6: Santos Risk Matrix

	I	II	III	IV	V	VI
f	2	3	4	5	5	5
e	2	3	4	4	5	5
d	2	2	3	4	4	5
c	1	2	2	3	4	5
b	1	1	2	2	3	4
a	1	1	1	2	3	3

Table 5-7: Santos Risk Significance Rating

RISK LEVEL	MITIGATION / INVESTIGATION FOCUS (ADD ADDITIONAL BUSINESS UNIT SPECIFIC REQUIREMENTS WHERE REQUIRED)
5	- Intolerable risk level - Following verification of the residual risk at level 5, activity must stop - Activity cannot recommence until controls implemented to reduce residual risk to level 4 or lower - Dedicated multi-disciplinary incident investigation team - Management involvement in the investigation
4	- Assess risk to determine if ALARP - If ALARP, activities related to maintenance of controls/ barriers prioritised & managed - If not ALARP, improve existing controls and/or implement new control/s - Dedicated multi-disciplinary incident investigation team
3	- Assess risk to determine if ALARP - If ALARP, activities related to maintenance of controls/ barriers prioritised & managed - If not ALARP, improve existing controls and/or implement new control/s - Full incident investigation
2	- Assess risk to determine if ALARP - If ALARP, activities related to maintenance of controls/ barriers prioritised & managed - If not ALARP, improve existing controls and/or implement new control/s - Incident investigations using simple tools
1	- Managed as stipulated by the related work processes - No incident investigation required

5.10 Determination of Impact and Risk Acceptability

The model Santos used for determining acceptance of residual risk is detailed in Figure 5-2. In summary:

A Level 5 residual risk is intolerable and must not be accepted or approved by Management.

A Level 2 – 4 residual risk is acceptable provided that ALARP has been achieved and demonstrated.

A level 1 residual risk is acceptable and it is assumed that ALARP has been achieved.

In addition to the requirements detailed above, for the purposes of offshore petroleum activities, impacts and risk to the environment are considered broadly acceptable if:

- The residual risk is determined to be 1 (and ALARP Decision Type A selected and good practice control measures applied), or
- The residual risk is determined between 2 and 4 and ALARP can be demonstrated; and
- The following have been met:
  - Principles of ecologically sustainable development
  - Legal and other requirements
  - Santos policies and standards
  - Stakeholder expectations.

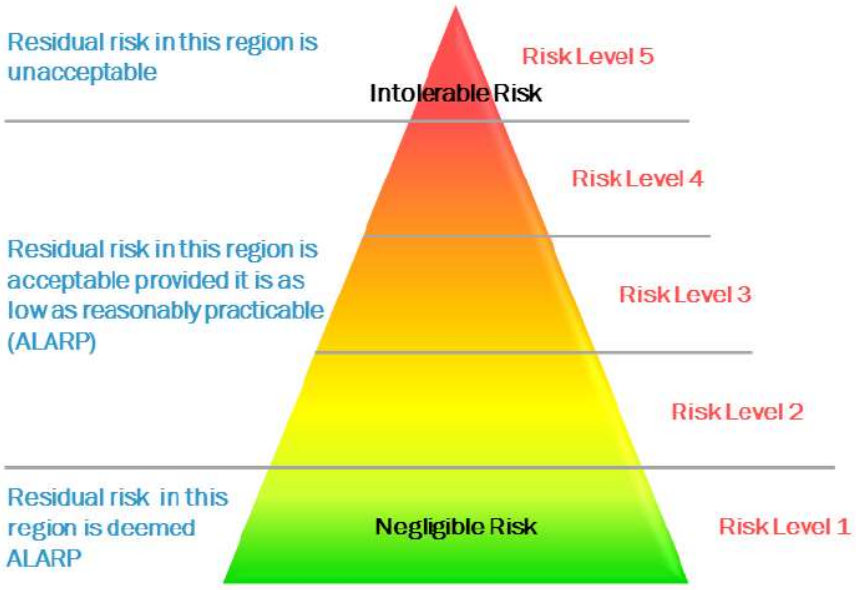

Figure 5-2: Santos Residual Risk Acceptance Model

6 ENVIRONMENTAL IMPACTS AND RISKS

6.1 Summary

The risk assessment identified 6 hazards specifically associated with the planned activities covered by the EP (Table 6-1), and 7 potential sources of environmental risks associated with unplanned events that may occur during the cessation phase (Table 6-2). For unplanned events, Table 6-2 presents the highest residual risk ranking for all sources of the hazard that were considered, with detail for each of the respective sources of each assessed hazard provided in Sections 6.8 - 6.14.

Table 6-1: Summary of Environmental Risk Assessment for Planned Events

Hazard	Consequences	Residual Risk
Interaction with marine users	Negligible	Very Low
Seabed disturbance	Negligible	Very Low
Light emissions	Negligible	Very Low
Noise emissions	Minor	Low
Atmospheric emissions	Negligible	Very Low
Planned discharges	Negligible	Very Low

Table 6-2: Summary of Environmental Risk Assessment for Unplanned Events

Hazard	Consequence	Likelihood	Residual Risk
Introduction of invasive marine species	Moderate	Remote	Very Low
Marine fauna interactions	Minor	Unlikely	Very Low
Solid discharges and dropped objects	Negligible	Occasional	Low
Minor liquid discharges	Negligible	Likely	Low
Subsea infrastructure discharges	Negligible	Unlikely	Very Low
Diesel spill (surface spill) from a vessel collision	Moderate	Unlikely	Low
Hydrocarbon release (subsurface) due to a catastrophic loss of wellhead	Major	Remote	Low

6.2 Interaction with Marine Users

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-3.

6.2.1 Hazard

The physical presence of vessels involved in inspection/maintenance, ROV surveys and other activities have the potential to interact with marine users in the area. The presence of the subsea infrastructure and the

associated safety exclusion zones, have the potential to locally disrupt the activities of shipping and commercial fishers.

6.2.2 Potential Impacts

The known and potential environmental impact of interactions with other marine users are: disruption to commercial shipping activity; and disruption of the activities of commercial fishers.

6.2.3 Assessment and Management of Impacts and Risks

The presence of subsea infrastructure will not present a hazard risk to other marine users since the DTM (the shallowest part of the facility) will be lowered below the sea surface on FPSO disconnection. However, the presence of exclusion zones may cause shipping to deviate from its preferred course to avoid the area and the exclusion zones/infrastructure may deter fishing activity, potentially resulting in loss of an area of productive fishing. As the wells/infrastructure and exclusion zones are already gazetted, marine users are already aware of their presence and as such are not expected to present any change in the navigation hazard risk.

The eastern most boundary of the operational area is approximately 5 nm west of the Dampier Shipping Fairway with the DTM being approximately 13 nm west of the Fairway. Impacts on shipping movements are therefore expected to be minimal.

Given the distance offshore, the depths at the site and the absence of reefs, it is unlikely that any recreational fishing occurs in the area. Consultation with RecFish West confirms this assessment. There are no tourism related activities expected to occur in the area given the distance from nearest shore.

Commercial fishing activity within the operational area is low. WAFIC has advised Santos that only one State-managed Fishery (Pilbara Demersal Scalefish Fishery) has recorded fishing effort within the operational area in the last five years. Consultation with WAFIC suggests that there is likely to be no direct impact to fishing operations in the area. The licence holders in this fishery have not raised any concerns during the previous 8 years of ME Development operations, nor in the recent invitations to comment.

With the controls proposed, the impacts from interaction/interference with other marine users of the area from physical presence of vessels and subsea infrastructure was assessed to be Negligible.

Table 6-3: Summary of Impacts and Control Measures – Interaction with Marine Users

Interaction with Marine Users	
Impact	**Control Measure**
Interaction/interference with other marine users of the area from physical presence of vessels and subsea infrastructure	*Mooring Inspection* ROV mooring inspection completed prior to FPSO sail-away and during subsequent inspection/maintenance campaigns.
	AMSA Requirements Positions of wells and DTM gazetted and marked on navigation charts so marine users are aware of navigation hazards.
	Santos Stakeholder Consultation Santos undertakes stakeholder consultation, including Notice to Mariners via notifications to Australian Hydrographic Service (AHS) prior to commencement of the activity.

6.3 Seabed Disturbance

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-4.

6.3.1 Hazard

The following will result or have the potential to result in seabed disturbance from inspection/maintenance activities during the cessation of production phase:

- Interaction of the ROV with the seabed from direct contact and placement of ROV tool baskets on seabed;
- Placement of up to 5x anode skids on the seabed until their removal during field decommissioning phase; and
- Sediment grab samples for environmental analysis.

The movement of the ROV near the seafloor may disturb the seabed, either by direct contact or via the thrust from its propulsion system, during inspection/maintenance activities and ROV surveys including the temporary placement of ROV tool baskets on the seabed.

The physical presence of the existing subsea infrastructure has the potential to disturb the seabed and benthic marine habitats during the period that the infrastructure remains 'preserved' on the seabed following departure of the FPSO, however for the purpose of the EP, no new seabed disturbance is expected.

During inspection/maintenance activities, there will be no vessel anchoring in the operational area as the vessels use dynamic positioning systems to maintain position.

6.3.2 Potential Impacts

Interaction of the ROV and associated equipment with the seabed, and the placement of anode skids on the seabed will cause the following impacts:

- Direct physical disturbance of the seabed and associated benthic habitats;
- Indirect disturbance to benthic habitats and associated marine fauna by sedimentation; and
- Increased turbidity of the near-seabed water column.

Temporary loss of a small area of benthic habitat and associated biota will occur under the equipment (e.g. ROV tool baskets and anode skids). Once ROV tool baskets have been retrieved on completion of inspection/maintenance activities, and anode skids have been retrieved (in subsequent decommissioning phase), seabed habitats will be recolonised by the settlement and migration of marine organisms into the area.

6.3.3 Assessment and Management of Impacts and Risks

As exploration drilling and production activities have occurred in the operational area and as the infrastructure has been in place for an extended period, impacts to the seabed are expected to have already occurred. The phase change in the status of the pipelines from 'operating' to 'preserved' will not alter the external footprint, although some additional sediment erosion/deposition may occur over the period covered by the EP, until the field decommissioning phase. Placement of equipment necessary for the inspection/maintenance activities during the cessation phase will result in a very small area of seabed disturbance in comparison to the vast size of soft substrata habitats spanning the North-West Shelf. The impacted benthic habitats and associated biota are well represented in the region and there are no known areas of sensitive habitat (e.g. corals, seagrass) within the operational area.

ROV activities may cause some localised disturbance to the seabed in the immediate vicinity of the infrastructure, either from the ROV movements and/or equipment/infrastructure placed on the seabed (e.g. ROV tool baskets, anode skids). This disturbance will be very small in comparison to the infrastructure footprint (which is in itself small at 1.8 ha). Placement of equipment/infrastructure on the seabed will not occur on any KEFs. Santos will contract a reputable ROV services supplier with appropriately qualified/certified and experienced ROV technicians that will minimise the potential for inadvertent contact with the seabed. ROV activities will be limited to the immediate vicinity of infrastructure, where there are no benthic habitats of conservation significance.

Table 6-4: Summary of Impacts and Control Measures – Seabed Disturbance

Seabed Disturbance	
Impact	**Control Measure**
– Direct disturbance to seabed and associated benthic communities. – Localised and temporary increase in turbidity Indirect disturbance to benthic habitats and associated marine fauna by sedimentation.	*ROV Procedures* Santos and third party (ROV operator) procedures, include laydown locations of equipment/infrastructure and restricted to immediate vicinity (within 10 m) of existing infrastructure.
	Contractor Vessel Procedures Vessel logs confirm no anchoring within operational area.
	Santos Contractor Selection Process Santos selection process for ROV contractor requires demonstration of competent, qualified and certified ROV operator.

6.4 Light Emissions

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-5.

6.4.1 Hazard

During inspection and maintenance activities, the vessels will operate day and night and are required to be lit for navigational purposes and for safe deck operations when working at night. Spot lighting may also be used on an as-needed basis, such as during ROV deployment and retrieval.

Lighting will typically consist of bright white (i.e. metal halide, halogen, fluorescent) lights 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 commercial fishing.

Lighting on ROVs will emit light underwater.

6.4.2 Potential Impacts

Given the temporary nature of vessel lighting, predicted impacts to fauna would be limited to:

- Localised attraction.

6.4.3 Assessment and Management of Impacts and Risks

Continuous lighting in the same location for an extended period of time whilst the vessels are on location in the operational area may result in alterations to normal marine fauna behaviour, as discussed below.

Fish

The response of fish to light emissions varies according to species and habitat. The artificial light serves to focus their marine plankton prey and consequently leads to enhanced foraging success. Light spill onto the surface waters surrounding the vessels is expected to have a short-term localised increase in fish activity, however with negligible impacts to the local fish populations are anticipated.

Turtles

Artificial light is identified as a potential threat to marine turtles in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) because it disrupts critical behaviour such as hatchling orientation and females returning to nesting beaches. Five species of marine turtle may occur within the operational area. However, no biologically important areas or critical habitat for turtles occur within the operational area.

Given the distance from turtle nesting beaches, as vessels will not remain in one location for long periods of

time, and as light emissions would be localised to within metres of the vessel, and short-term, impacts to marine turtles passing through the operational area are expected to be negligible.

Marine Birds

Seabirds may be attracted to vessels at night due to light glow. Lighting may also provide enhanced capability for seabirds to forage at night. Bright lighting can disorientate birds, thereby increasing the likelihood of seabird injury or mortality through collision with infrastructure, or mortality from starvation due to disrupted foraging at sea. Nesting birds may be disorientated where lighting is adjacent to rookeries, however, this is not identified as a potential impact as the nearest rookeries are on land over 100 km from the operational area.

Lighting from the vessels will be localised to a small radius of light glow around the vessels and temporary in nature as vessels are on location within and transit through the operational area over the short duration of the inspection/maintenance activities (up to 14 days per survey). No biologically important areas, critical habitat or specific aggregation areas have been identified as potentially occurring within the operational area. As such, it is only expected that transient individuals will be exposed to changes in ambient light levels. Consequently, as light emissions would be localised, within metres of the vessel, and short-term as vessels are on location within and transit through the operational area, impacts to marine birds are predicted to be negligible. Light emissions are not predicted to result in any impacts to local populations of migratory species or any disruption to migratory behaviour.

Table 6-5: Summary of Impacts and Control Measures – Light Emissions

Light Emissions	
Impact	**Control Measure**
Localised attraction of fauna to vessel lighting	*Lighting Requirements* Lighting not required to meet navigational and safe operational requirements will be reduced where practicable and safe to do so. External lights will be directed onto deck, except where required for navigation purposes or safe operations, or activities requiring lowering equipment overboard.

6.5 Atmospheric Emissions

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-6.

6.5.1 Hazard

Vessel activities will generate atmospheric emissions from the combustion of marine diesel from vessel engines and deck equipment. There will be no incineration of waste onboard the vessels within the operational area.

6.5.2 Potential Impacts

The known and potential environmental impacts of atmospheric emissions are:

- Localised and temporary decrease in air quality
- Contribution to global greenhouse gas effect

Due to the very short duration and relatively small scale of the inspection/maintenance campaigns, the potential for significant impacts is limited.

6.5.3 Assessment and Management of Impacts and Risks

The combustion of diesel in vessels may result in a localised reduction in air quality. Greenhouse gases will be produced via the combustion of diesel in vessel engines, generators and deck equipment.

Due to the short duration of inspection/maintenance campaign (up to 14 days per campaign) and proximity to settlements (>100 km from Dampier), air emissions are not expected to result in a detectable impact to

sensitive receptors. In addition to this, total air emissions generated from the survey would represent an insignificant contribution to overall greenhouse gas emissions. Consequently, air emissions would be localised and short-term and potential impacts are unlikely. Atmospheric emissions are not predicted to result in any impacts to local populations of migratory species or any disruption to migratory behaviour.

Table 6-6: Summary of Impacts and Control Measures - Atmospheric Emissions

Atmospheric Emissions	
Impact	**Control Measure**
– Localised and temporary decrease in quality; – Contribution to global greenhouse gas (GHG) effect	Vessel comply with *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which reflect MARPOL Annex VI (Prevention of Air Pollution from Ships) requirements. Specifically, Annex VI requires: • Sulphur content of fuel oil not to exceed 3.5% thus reducing quantities of sulphur oxides produced. • Vessels with gross tonnage >400 t have International Air Pollution Certificate (IAPP).
	Equipment Maintenance Vessel engines / generators / noise generating equipment are maintained in accordance with Planned Maintenance System (PMS).
	Santos Procedures Prior to inspection/ maintenance campaigns, Santos will review Offshore Vessel Inspection Database (OVID) to confirm vessel inspections, PMS for noise generating equipment and vessels procedures for interacting with marine megafauna.

6.6 Noise Emissions

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-7.

6.6.1 Hazard

Underwater noise emissions will occur from vessel engines and thrusters.

6.6.2 Potential Impacts

Given the levels of noise predicted, potential impacts to fauna would be limited to non-physiological effects such as:

- Behavioural changes.
- Localised avoidance.

6.6.3 Assessment and Management of Impacts and Risks

Activities that generate underwater noise can affect marine fauna by interfering with aural communication, eliciting changes in behaviour or, in extreme cases, by causing physiological damage to auditory organs. The potential for noise from anthropogenic sources to impact fauna depends on a range of factors, including the intensity and frequencies of the noise, prevailing ambient noise levels and the proximity of noise sensitive species.

The dominant noise source during the inspection/maintenance campaigns will be from the vessel dynamic positioning (DP) thrusters.

Underwater noise generated by the presence of the vessels may result in changes in behaviour of marine fauna such as disturbance, avoidance or attraction. Underwater noise from the vessels is transient and is typical of other underwater noise emitted by commercial shipping or fishing vessels in the region.

There are no recognised habitats critical to the survival of marine turtles, or BIAs for marine turtles in or in the vicinity of the operational area. The nearest (flatback turtle internesting habitat in the Dampier Archipelago) is located approximately 32 km away. Marine turtles transiting the operational area may avoid the immediate area around the vessels. However, based on the noise levels likely from the inspection vessels, and the short duration of inspection/maintenance campaigns (up to 14 days), this is not expected to interrupt biologically important behaviours or to displace turtles from critical habitat. Since the activities are being managed to reduce noise impacts and it is reasonable to conclude that any short-term avoidance behaviour will not affect the conservation status of marine turtles that transit the operational area, the activities are considered to be consistent with the objectives and recovery actions that form the basis of the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017).

There is no habitat identified as critical to the survival of any whale species within the operational area. The operational area does not overlap any BIAs for fin, sei or humpback whales, although it does overlap a BIA (distribution) for pygmy blue whale. This area extends across a width of approximately 420 km in the vicinity of the operational area and from Perth Canyon/ Naturaliste Plateau region in the south along the WA coastline and up to Scott Reef and Indonesia in the north. Based on the noise levels likely from the inspection vessels, and the short duration of inspection/maintenance campaigns (up to 14 days), whales transiting or in the vicinity of the operational area, may avoid the immediate area around the vessels. However underwater noise levels are expected to be localised, with possible effects to whales limited to, at worst, short-term avoidance behaviour. Infrequent, localised and temporary avoidance of a small area within the operational area will not affect the conservation status of pygmy blue, humpback, fin and sei whales that transit the operational area, or compromise the objectives or recovery actions that form the basis of the Management Plans and Conservation Advice for these species.

There are also no commercial fishing habitats within the operational area likely to support reef or site attached fish.

Based on the noise levels likely from the vessels, the short duration of inspection/maintenance campaigns (up to 14 days), and the likelihood that noise sensitive species may transit the operational area, impacts are at worst predicted to be localised and short-term avoidance behaviour in the vicinity of the vessels.

Table 6-7: Summary of Impacts and Control Measures – Noise Emissions

Noise Emissions	
Impact	**Control Measure**
Disturbance to marine fauna from vessel noise causing behaviour changes and/or avoidance	*Legislation/Regulatory Requirements* Vessels compliant with requirements outlined in EPBC Regulations – Part 8 Division 8.1 (r.05) – Interacting with Cetaceans, adapted to include whale sharks and marine turtles. Vessels will: • Travel at less than 6 knots within the caution zone (50 m radius for dolphins, 100 m for whales, whale sharks and turtles). • Do not approach closer than the caution zone. • Vessel bridge watchkeeper to keep look out for cetaceans, whale sharks and turtles during vessel movements in the operational area. If sighted near the path of the vessel, the vessel shall gradually divert to avoid it, slow down to idling speed, if safe and within the vessel's capability. • Sightings of marine fauna (cetaceans, whale sharks and marine turtles) will be recorded and reported to the Vessel Master.

	Santos Procedures Prior to inspection/maintenance campaigns, Santos will review Offshore Vessel Inspection Database (OVID) to confirm vessel inspections, PMS for noise generating equipment and vessels procedures for interacting with marine megafauna.

6.7 Planned Discharges

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-8.

6.7.1 Hazard

The following planned routine discharges to the marine environment may take place during the inspection/maintenance campaigns:

- Sewage and grey water
- Food waste
- Desalination plant effluent (brine)
- Cooling water
- Deck drainage
- Oily water (i.e. bilge water) discharges
- Hydraulic fluids (e.g. ROV hydraulic fluid) and chemicals (e.g. corrosion inhibitor, scalant, biocides, and acid wash chemicals such as citric acid or sulfamic acid).

6.7.2 Potential Impacts

The known and potential environmental impact of planned discharges is:

- Localised impact on water quality from increased temperature, salinity, turbidity, nutrients and toxicity effects from hydrocarbons and chemicals.

6.7.3 Assessment and Management of Impacts and Risks

Sewage and Greywater

Sewage and greywater discharges can cause temporary and localised turbidity and nutrient enrichment. Sewage is treated in a sewage treatment plant onboard the vessels prior to discharge reducing solid levels and hence turbidity and nutrient content. Grey waters include shower, hand basin and sink discharges and are not treated prior to discharge.

Any changes to water quality will be limited to surface waters with these wastes rapidly diluted in the surface layers of the water column and dispersed by currents. Given the high dilution and dispersal, low volumes and short discharge period, discharge of these wastes is expected to result in localised changes to water quality periodically around the vessels over the short duration of discharge for the short duration of the survey (up to 14 days). Consequently, sewage and greywater discharges will be localised, within metres of the vessel, and short-term as the vessel moves through the area for a duration of up to 14 days, impacts to fauna are unlikely.

Putrescible Waste

Under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983,* food/galley wastes of <25 mm size are permitted to be discharged overboard when a vessel is en-route, and is located greater than 3 nm from land.

Periodic discharge of macerated food scraps to the marine environment will result in a temporary increase in nutrients in the water column that is expected to be localised to waters surrounding the vessel over the short duration of inspection/maintenance campaigns. Any impacts to fauna associated with an increased food source would be temporary and not lead to changes of behaviour due to the short periods of time the vessels would

be in one area. Consequently, given the high dilution and dispersal, low volumes and short discharge period, discharge of macerated food scraps will be localised, within metres of the vessels, and short-term based on the duration of the inspection/maintenance campaigns (up to 14 days), therefore, impacts to fauna including fauna of an environmental value are unlikely.

Brine

Vessels will have fresh water generators to make freshwater for drinking, showers and cooking. Fresh water generators use either reverse osmosis or distillation. Both processes result in the discharge of seawater with a slightly elevated salinity (~10% higher).

Any increases in salinity from the discharge of brine will be limited to surface waters, with these discharges rapidly diluted in the surface layers of the water column and dispersed by currents. Given the high dilution and dispersal, low volumes and short discharge period, discharge of brine is expected to result in localised changes to water quality periodically around the vessels over the short duration of the inspection/maintenance campaigns (up to 14 days). Consequently, brine discharges will be localised, within metres of the vessels, and short-term, therefore, impacts to fauna including fauna of an environmental value are unlikely.

Cooling Water

Vessels will either use seawater as a heat exchange medium for cooling engines or have box coolers that have no discharge. Where seawater is used as a cooling medium, discharge temperatures are typically 5 to 10 °C higher than ambient seawater temperature.

Any increases in water temperature will be limited to surface waters with these discharges rapidly diluted in the surface layers of the water column and dispersed by currents. Given the high dilution and dispersal, low volumes and short discharge period, discharge of these cooling water is expected to result in localised changes to water quality periodically around the vessels over the short duration of the inspection/maintenance campaigns (up to 14 days). Consequently, cooling water discharges will be localised, within metres of the vessel, and short-term, therefore, impacts to fauna including fauna of an environmental value are unlikely.

Deck Drainage

Decks are maintained clean and free from oil and grease, with all hazardous materials stored in bunded areas and drip trays under any potential leakage points. Uncontaminated deck drainage from rain, sea splash and wash down water is channelled via scuppers directly into the sea. Impacts from deck drainage can only occur from minor spills that are not appropriately responded to and cleaned up. These spills can potentially be discharged into the marine environment via deck drainage.

Given the high dilution and dispersal, low volumes and short discharge period, discharge of contaminated deck drainage is expected to result in localised changes to water quality periodically around the vessels over the short duration of the inspection/maintenance campaigns (up to 14 days). Consequently, deck drainage discharges will be localised, within metres of the vessel, and short-term, therefore, impacts to fauna including fauna of an environmental value are unlikely.

Bilge Water

Bilge water is the mixture of water, oily fluids, lubricants, cleaning fluids, and other similar wastes that accumulate in the lowest part of a vessel typically from engines and machinery. It is managed by either being retained in a holding tank and discharged to a facility on-shore, or treated onboard with an oily water separator (OWS) after which the treated bilge water can be discharged overboard if the oil-in-water concentration is below 15 ppm. Discharge can only be undertaken while the vessel is moving.

As the vessels will be moving whilst discharging bilge waters that are treated to reduce hydrocarbon content to below 15 ppm, any changes to water quality will be limited to surface waters with these discharges rapidly diluted in the surface layers of the water column and dispersed by currents. Given the high dilution and dispersal, low volumes and short discharge period, discharge of these wastes is expected to result in localised changes to water quality periodically around the vessels over the short duration of the inspection/maintenance campaigns (up to 14 days). Consequently, bilge water discharges will be localised, within metres of the vessel, and short-term as the vessel moves around during discharge, therefore, impacts to fauna including fauna of an environmental value are unlikely.

Hydraulic Fluids and Chemicals

Small volumes of hydraulic fluids (from the use of ROVs) and chemicals such as acid wash are likely to be discharged subsea during the inspection/maintenance campaigns. Worst-case discharge volumes are expected to be in the region of 10 L (hydraulic fluid).

Acid wash chemicals (such as citric acid or sulfamic acid) will be discharged during calcareous marine growth removal using an ROV, if water jetting is not sufficient. Marine growth removal will result in a temporary decrease in water quality associated with increased turbidity from action of sloughing off of the marine biological growth and associated sand/silt/carbonate substrate.

Hydraulic fluids, lubricating fluids and non-hazardous chemical are used extensively by the petroleum industry in subsea production systems. Their discharge subsea is unavoidable. These subsea discharges of low volumes of hydraulic fluids and chemicals are expected to rapidly disperse in the offshore marine environment. As such, any potential impacts from toxicity would be confined to a localised area immediately surrounding the subsea infrastructure on which inspection/maintenance is being carried out, or around the ROV (in the case of ROV hydraulic fluid discharge). Given the high dilution and dispersal, low volumes and short discharge period, discharge of these wastes is expected to result in localised changes to water quality over the short duration of the inspection/maintenance campaigns, with water quality returning to ambient conditions within hours. Therefore, impacts to fauna are unlikely.

Impacts associated with the physical removal of marine growth will be limited to localised water column turbidity and subsequent deposition of marine growth and sediment immediately adjacent to the subsea infrastructure being worked on by the ROV. Impacts to fauna and seabed habitats are unlikely.

Table 6-8: Summary of Impacts and Control Measures – Planned Discharges

Planned Discharges	
Impact	**Control Measure**
Localised and temporary impact on water quality	*MARPOL Requirements – Oil:* • Vessels hold a current International Oil Pollution Preventions (IOPP) Certificate for oily water filtering equipment. • No discharge from vessels whilst stationary. • Bilge water and oily water is only discharged if the oil-in-water content does not exceed 15 ppm. • Where the oil-in-water content exceeds 15 ppm, the oily water is contained onboard and disposed of at a licence onshore reception facility. • Vessels have and implement an approved Shipboard Oil Pollution Emergency Plan (SOPEP), or Shipboard Marine Pollution Emergency Plan (SMPEP).
	MARPOL Requirements – Sewage: • Vessels hold a current International Sewage Pollution Prevention (ISPP) Certificate • Sewage discharges treated via a MARPOL-compliant sewage treatment plant (STP).
	Vessel comply with *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which reflect MARPOL Annex V requirements, specifically:

	• Garbage / waste management plan and garbage record book is required to be in place and implemented.
	Cooling Water Systems Cooling water systems and fresh water generators operated within operating parameters, and inspection /maintenance on Planned Maintenance System.
	MARPOL Requirements – Garbage: Garbage / waste management plan and garbage record book is required to be in place on vessels and implemented. Putrescibles and other food waste will only be discharged when: • Comminuted or ground to a particle size of ≤25 mm and ≥3 nm from the nearest land.
	Santos Procedures Santos' offshore chemical assessment process ensures that chemicals are evaluated and approved if there is the potential for release to the environment.
	Santos Procedures Prior to inspection maintenance campaigns, Santos will review Offshore Vessel Inspection Database (OVID) to confirm vessel inspections, vessel compliance and PMS in place.

6.8 Unplanned Event - Introduction of Invasive Marine Species

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-9.

6.8.1 Hazard

Vessels and in-sea equipment (e.g. ROVs, anchors, etc.) that are internationally mobilised have the potential to result in the introduction of invasive marine species (IMS) to the operational area through the following:

- Vessel ballast water discharge.
- Biofouling of vessel hull or in-sea equipment.

6.8.2 Potential Impacts

The known and potential environmental impacts of IMS are:

- Out-competing native flora and fauna for food and space.
- Over-predation of native flora and fauna resulting in reduction in native species diversity and abundance.
- Depletion of viable fishing areas and aquaculture stock.
- Damage to maritime and industrial infrastructure and equipment.
- Reduction in coastal aesthetics.

6.8.3 Assessment and Management of Impacts and Risks

IMS are marine flora and fauna that have been introduced into a region that is outside of their natural range of distribution and have established themselves, becoming a threat to the local environment. IMS can be very difficult to eradicate or contain once established in the aquatic environment. Some have the potential to become

serious pests and pose a significant risk to environmental values, local biodiversity, ecosystem health, human health, fisheries, aquaculture, shipping, ports and tourism.

Vessels and in-sea equipment have the potential to transport and introduce marine pests from ballast water or biofouling. During the activity, for an IMS to become established in the operational area, a number of key conditions must be met first:

1. IMS must be present at one or more locations where the vessel/in-sea equipment has recently operated (e.g. home port).
2. The vessel/in-sea equipment must have areas or conditions that are not appropriately treated prior to entry to Australian waters, and are suitable for transporting and keeping the IMS alive, from the time IMS is taken onboard to the time the vessel/in-sea equipment arrives at the place of potential introduction.
3. The environment at the place of potential induction must be suitable for IMS to settle, reproduce, propagate and successfully establish a viable new local population.

Given the water depth of the operational area (~130–160 m) creating an environment unfavourable for their survival or successful establishment (e.g. light limiting and low habitat biodiversity with sparse epibiota) and distance from shallow coastal habitats (>100 km), there is a low likelihood that IMS would be able to survive translocation, and even lower likelihood they would settle and subsequently establish and colonise. Habitats typically suitable for the successful establishment and colonisation of IMS are ports, marinas and highly disturbed environments. Vessels will not anchor within the operational area, instead will use a DP system rather than an anchor system to maintain position, further reducing the likelihood of translocation of IMS to the seabed. In the event that an introduction of IMS was to occur and became established in this area, it is expected that this would result in a localised but medium-term impact to marine fauna and the ecosystem as a whole in the operational area, and potentially to other commercial users of the area should cross contamination between vessels occur.

Table 6-9: Summary of Impacts and Control Measures – Introduction of IMS

Introduction of IMS	
Impact	**Control Measure**
Introduction and establishment of marine pest species	*Biosecurity Requirements* Pre-arrival information must be reported through the Maritime Arrivals Reporting System (MARS) prior to arrival in Australian waters.
	Ballast Water Management Vessels will manage ballast water in accordance with Australian Ballast Water Management Requirements (DAWR, 2017), specifically: • Ballast Water Management Plan in place • Ballast Water Management Certificate • Reporting of ballast water discharges • Maintain a Ballast Water Record System
	Vessel Biofouling Management Vessels required to maintain: • Biofouling management plan • Biofouling record book • An anti-fouling certificate is required to be in place for vessels.

	In-Sea Equipment Biofouling Management In-sea equipment will be inspected for biofouling and cleaned prior to deployment.

6.9 Unplanned Event - Marine Fauna Interactions

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-10.

6.9.1 Hazard

Whilst in the operational area, vessels and ROVs undertaking inspection/maintenance campaigns have the potential to interact with marine fauna.

6.9.2 Potential Impacts

The known and potential environmental impacts and risks from vessel/ROV interactions with marine fauna are:

- Injury and/or death from vessel strike.
- Injury and/or death from ROV strike/entanglement.

6.9.3 Assessment and Management of Impacts and Risks

Marine fauna such as cetaceans, whale sharks and marine turtles that are likely to be in surface waters are potentially at risk from being struck by a vessel.

Potential impacts to fauna can also occur from entanglement in the ROV umbilical lines or strike from ROV. Turtles are seen as potentially at risk as they can become caught and drown.

The risk of vessel strike and entanglement is limited to the footprint of the vessels, which is temporary in nature as the vessels undertake inspection/maintenance activities within the operational area over the short duration of the campaigns (up to 14 days per campaign). Within the operational area, it is expected that numbers of cetaceans, present will be low as there are no identified feeding, breeding, aggregation or migration areas are present. The operational area does not overlap any BIAs for marine turtles, as such numbers are expected to be low and limited to individual transient species. Unplanned marine fauna interactions are not predicted to result in any impacts to local populations of migratory species or any disruption to migratory behaviour.

Table 6-10: Summary of Impacts and Control Measures – Marine Fauna Interactions

Marine Fauna Interactions	
Impact	**Control Measure**
Injury and/or death from vessel strike	*Legislative/Regulatory Requirements* Vessels-cetacean interaction procedures compliant with requirements outlined in EPBC Regulations – Part 8 Division 8.1 – Interacting with Cetaceans, adapted for turtles and whale sharks): Vessels will: • Travel at less than 6 knots within the caution zone (50 m radius for dolphins, 100 m for whales, whale sharks and turtles). • Do not approach closer than the caution zone. • Vessel bridge watchkeeper to keep look out for cetaceans, whale sharks and turtles during vessel movements in the operational area. If sighted near the path of the vessel, the vessel shall gradually divert to avoid it, slow down to idling speed, if safe and within the vessel's capability.

	• Sightings of marine fauna (cetaceans, whale sharks and marine turtles) will be reported and reported to the Vessel Master.
	Reporting Collisions between vessels and cetaceans (known as ship strikes) will be reported via the online National Ship Strike Database.

6.10 Unplanned Event - Solid Discharges and Dropped Objects

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-11.

6.10.1 Hazard

The following may result in potential harm to local and protected marine fauna and seabed disturbance during the cessation of production phase:

- Solid waste materials accidentally blown overboard
- Dropped objects accidentally released overboard from a vessel during lifting/handling activities
- DTM loses buoyancy and descends to the seabed.

6.10.2 Potential Impacts

Predicted potential environmental impacts of the discharge of solid waste materials and dropped objects are:

- Marine fauna from ingestion/entanglement with non-hazardous solid waste material
- Localised and temporary decrease in water quality from discharge of non-hazardous solid waste material
- Seabed disturbance and/or loss of benthic habitat and associated communities from dropped objects
- Damage to commercial trawling or fishing equipment from dropped objects.

6.10.3 Assessment and Management of Impacts and Risks

Solid Waste Materials Blown Overboard

Windblown wastes not recovered from the marine environment may impact fauna if it is eaten or via entanglement. Ingestion or entanglement of windblown waste has the potential to result in fauna mortality. Windblown wastes would be rare as wastes with the potential to be windblown will be stored in closed containers and in the event of waste being blown overboard attempts would be made to recover it.

Disturbance to Benthic Habitat from Dropped Objects Overboard from Vessels

Seabed disturbance can result from a dropped object overboard from a vessel during the inspection/maintenance campaigns. Dropped objects can occur (albeit highly unlikely) during lifting/handling activities either manually or using crane/hoist lifting gear. Dropped objects may include containers or equipment (e.g. anode skids, ROV, etc.). Vessel anchoring will not occur in the operational area, as the vessels will use DP systems to maintain position.

Any dropped objects will be recovered if safe and practicable to do so. In the unlikely event that an object was dropped and not recoverable, impacts to benthic habitats would be localised due to the size of the object interacting with the seabed. In addition, any impacts would be expected to recover and thus are considered short-term.

Table 6-11: Summary of Impacts and Control Measures – Solid Discharges and Dropped Objects

Solid Discharges and Dropped Objects	
Impact	**Control Measure**
– Seabed disturbance from dropped object from vessel. – Seabed disturbance from DTM losing buoyancy and descending to seafloor. – Impact to fauna (ingestion/entanglement) from	*Lifting Procedures* • Lifts across water will be undertaken within safe work loads. • All lifts to be completed in accordance with contractor procedures. • All lifting equipment will be certified, is regularly inspected/maintained and will be used by crew trained in task required.

accidental discharge of solid waste material.	*Dropped Objects* Recovery of dropped objects where practicable and safe to do so.
	Waste Management • Waste will be handled according to the vessel waste management plan. • Solid waste tracked, logged and sent to shore for recycling or disposal at a government approved waste disposal site. • Waste containers (bins, etc.) provided for waste containment clearly marked and suitably covered to prevent material being blown overboard.
	Reporting Any loss or discharge to sea of harmful materials to be reported to the AMSA Joint Rescue Coordination Centre.

6.11 Unplanned Event - Liquid Discharges

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-12.

6.11.1 Hazard

Deck spills on the vessels may potentially be released to the marine environment and could include spills/leaks from stored chemicals and hydrocarbons, and from equipment (including hydraulic hoses).

Leaks may also occur from equipment (e.g. ROVs) resulting in a subsea release of liquids such as hydraulic fluid, lube oil, and refined oil.

The maximum of the worst-case liquid discharge is unlikely to be greater than 80 L (0.5 bbl drum size) and for ROV hydraulic fluid is unlikely to be greater than 10 L.

6.11.2 Potential Impacts

Predicted potential environmental impacts of a chemical and hydrocarbon liquid discharges are:

- Temporary decline in water quality
- Toxic effects to the marine environment including marina fauna and flora.

6.11.3 Assessment and Management of Impacts and Risks

The potential environmental impacts include a reduction in water quality and toxic effects on surrounding marine flora and fauna. Accidental liquid discharges due to equipment leaks or stored chemical spills on vessels are generally small (10 to 80 L) and therefore would be highly unlikely to cause an impact on marine flora and fauna given the offshore, deepsea location and rapid dispersion by ocean currents.

In the event of a spill/leak, impacts are predicted to be confined to those receptors (e.g. fish, plankton) immediately adjacent to the source of the spill. Fish are highly mobile and predicted to move away from the spill area such that high numbers are unlikely to be exposed for extended durations that would be required to cause major toxic effects. In contrast, there is potential for localised mortality of plankton due to reduced water quality and toxicity.

With the consideration of the small area of a potential spill/leak, the rapid dispersion and dilution of spilled chemicals and hydrocarbon-based liquids, impacts are predicted to be localised and short-term, with water quality returning to ambient conditions within several hours of a spill occurring. Unplanned liquid discharges are not predicted to result in any impacts to local populations of migratory species or any disruption to migratory behaviour.

Table 6-12: Summary of Impacts and Control Measures – Solid Discharges and Dropped Objects

Liquid Discharges	
Impact	**Control Measure**
Toxic effects to the marine environment including marine fauna.	*MARPOL Requirements and Santos Vessel Compliance Procedures* All oily water exceeding 15 ppm must be contained and disposed of at licensed onshore reception facility or transferred to carrier licensed to receive waste. Liquids from drains may only be discharged if the oil-in-water content does not exceed 15 ppm after treatment in a MARPOL-compliant oily water filter system. Vessel have a current International Oil Pollution Prevention (IOPP) certificate for oily water filter system. Scupper plugs or equivalent deck drainage control measures available where hazardous chemicals and hydrocarbons are stored and frequently handled. Vessels have a current MARPOL-compliant Shipboard Oil Pollution Emergency Pollution (SOPEP) and/or Shipboard Marine Pollution Emergency Plan (SMPEP – for noxious liquid) – the latter may be combined with the SOPEP. All shipboard hazardous liquids, chemicals and hydrocarbon-based liquids stored in bunded areas. All shipboard hazardous liquids, chemicals and hydrocarbon deck spills managed in accordance with the SOPEP/SMPEP. Spill clean-up equipment is located where hazardous chemicals and hydrocarbons are frequently handled. Any loss or discharge to sea of harmful materials report to the AMSA Joint Rescue Coordination Centre.
	Santos Vessel Compliance Procedures Prior to the activity, Santos will review Offshore Vessel Inspection Database (OVID) to confirm vessel inspections, vessel compliance and PMS in place.
	OPEP Implementation Santos Mutineer-Exeter Cessation of Production Oil Pollution Emergency Plan developed and maintained for the duration of the cessation of production phase. Oil spill response executed in accordance with the OPEP.
	Planned Maintenance System Equipment on decks with the potential to leak and ROVs maintained in accordance with Planned Maintenance System (PMS).

6.12 Unplanned Event - Subsea Infrastructure Discharges

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-13.

6.12.1 Hazard

Potential sources of discharges of subsea infrastructure in the Mutineer-Exeter field during the cessation of production phase were identified as a rupture or leak from a flowline, service line or umbilical, or a non-catastrophic leak from a wellhead. A rupture or leak from a flowline, service line or umbilical may occur due to:

- Unplanned dropped object (e.g. anchor from commercial fishing vessel);
- DTM loses buoyancy and descends to seabed;
- Corrosion forces.

A failure of XT valve barriers due to corrosion forces could result in a non-catastrophic leak of reservoir hydrocarbons from the unplugged/ shut-in wells. The leak path would need to occur across a minimum of two XT valve barriers and one further external failed barrier, i.e., XT body, flange or pipe. In respect of the suspended wells, this risk does not apply as they are not in contact with the reservoir and isolated using packers and cement plugs. During the cessation period the MEFF wells will have five primary barrier and four secondary barriers between the reservoir fluids and the environment. Prior to the FPSO departing the primary and secondary well barriers will be tested and a subsea integrity survey will confirm the status of the XT. As detailed in the WOMP the XT valves are tested in accordance with API14B, therefore a non-catastrophic leak from an XT body, flange or pipe would result in a leak passing through one or two XT valves. Therefore, the credible worst-case leak rate, based on the API14B standard, is calculated as ~600 L/day. As the wells have ~95% water content, this equates to a discharge of ~30 L oil per day.

For context, during production current PFW discharge rates of ~18,000 m^3/day equates to 270 L/day of oil being discharged in the operational area at 15 ppm residual OIW content, and 540 L/day being discharged at 30 ppm residual OIW.

Potential discharge fluids from a rupture or leak from a flowline, service line, or umbilical include treated seawater (including corrosion inhibitor) and residual reservoir hydrocarbons (in the flowlines). Flushing activities will be undertaken prior to the departure of the FPSO (activities covered under the Operations EP) to reduce the oil in water (OIW) content and the volume of hydrocarbons released to the marine environment would be low.

6.12.2 Potential Impacts

Predicted potential environmental impacts of a subsea infrastructure discharges are:

- Temporary decline in water quality
- Toxic effects to the marine environment including marina fauna and flora.

6.12.3 Assessment and Management of Impacts and Risks

The potential environmental impacts include a reduction in water quality and toxic effects on surrounding marine flora and fauna. Liquid discharges from subsea infrastructure are predicted to be small and therefore would be highly unlikely to cause an impact on marine flora and fauna given the offshore, deepsea location and rapid dispersion by ocean currents. Unplanned discharges from subsea infrastructure are not predicted to result in any impacts to local populations of migratory species or any disruption to migratory behaviour.

In the event of a spill/leak, impacts are predicted to be confined to those receptors (e.g. fish, plankton) immediately adjacent to the source of the spill. Fish are highly mobile and predicted to move away from the spill area such that high numbers are unlikely to be exposed for extended durations that would be required to cause major toxic effects. In contrast, there is potential for localised mortality of plankton due to reduced water quality and toxicity.

The subsea infrastructure is not over pressured, and with consideration of the small volume of a potential spill/leak, the rapid dispersion and dilution of treated seawater, impacts are predicted to be localised and short-

term, with water quality returning to ambient conditions within several hours of a spill occurring from the pipeline, a flowline, service line, or umbilical.

With respect to a non-catastrophic leak of reservoir hydrocarbons from the unplugged/ shut-in wells, the high water content (~95%) equates to a discharge of ~30 L oil per day which is likely to be rapidly dispersed owing to the low volumes and discharge rate, and the relatively deep, oceanic location.

Table 6-13: Summary of Impacts and Control Measures – Subsea Infrastructure Discharges

Subsea Infrastructure Discharges	
Impact	**Control Measure**
Toxic effects to the marine environment including marine fauna	*Navigational Requirements* Wells and DTM gazetted and marked on navigational charts to minimise the risk of collision from third parties.
	ME Development Field Operations Annual Stakeholder Review (ME-7000-REP-0205). *Relevant stakeh*olders consulted/ advised of activities prior to commencement of individual inspection/maintenance campaigns. Notification of campaign activities, duration, location, etc., to AMSA's Joint Rescue Coordination Centre for AusCoast warning broadcasts, and to the Australian Hydrographic Service (AHS) who will issue a 'Notice to Mariners'.
	Santos Chemical Assessment Santos Offshore Chemical Assessment Process (0010-650-RIS-0001).
	Santos Mutineer Exeter Fletcher Finucance Well Operations Management Plan (WOMP): The WOMP includes control measures for well integrity that reduce the risk of an unplanned release of hydrocarbons. Wells are managed/ maintained in accordance to the WOMP and the OPGGS (Resource Management and Administration) Regulations 2001, which includes the subsea asset integrity management system to monitor for any potential leaks of hydrocarbons from wells. Integrity inspections are undertaken during the CoP phase to determine any leaks from wellheads.

6.13 Unplanned Event - Diesel Spill from Vessel Collision

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-14.

6.13.1 Hazard

A review of receptors within the operational area did not identify any current commercial or recreational fishing activity and limited shipping activity thus a vessel collision is unlikely but is classified as a credible scenario. The worst-case scenario is a vessel collision resulting in a ruptured vessel fuel tank causing the release of marine diesel oil (MDO) to the marine environment. A vessel collision could occur due to poor weather, human error or vessel navigation/equipment failure.

At this stage, vessels have not been contracted for the inspection/maintenance campaigns. Based on the type of offshore inspection vessel that may be used, the most credible maximum volume likely to be released from a rupture of a vessel tank is conservatively estimated to be 250 m^3. This maximum credible spill volume of 250 m^3 was used for modelling the scenario.

6.13.2 Potential Impacts

Predicted potential environmental impacts of a MDO spill are:

- Temporary decline in water quality
- Toxic effects to the marine environment including marina fauna and flora.

6.13.3 Assessment and Management of Impacts and Risks

Due to the weathering nature of MDO, a spill spreads rapidly and thinly and hence is not expected to result in fauna ingesting significant volumes or result in persistent oiling. Most evaporation of MDO is within the first 48 hours hence, fauna would be exposed to vapours for a short time frame, with only those individuals in close proximity to the source of the spill considered to be at greatest risk.

Although the likelihood of a vessel collision resulting in a MDO spill is very low, impacts can be wide ranging. A loss of MDO to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column. Hydrocarbons are not predicted to accumulate on shorelines above the 50 g/m^2 threshold value.

Table 6-14: Summary of Impacts and Control Measures – Diesel Spill from Vessel Collision

Diesel Spill from Vessel Collision	
Impact	**Control Measure**
Toxic effects to the marine environment including marine fauna	*Navigational Requirements* Vessels equipped with navigation aids (communication, radio, radar equipment, etc.) compliant with navigation safety requirements of *Navigation Act* 2012, SOLAS and relevant Marine Orders.
	Navigational Requirements Bridgewatch on vessels to be maintained 24-hours per day. Crew undertaking vessel bridgewatch will be qualified in accordance with International Convention of STCW95, AMAS Marine Order 71 – Masters and Deck Officers, or certified training equivalent.
	Stakeholder Consultation Relevant stakeholders consulted/ advised of activities prior to commencement of individual inspection/maintenance campaigns. Notification of campaign activities, duration, location, etc., to AMSA's Joint Rescue Coordination Centre for AusCoast warning broadcasts,

	and to the Australian Hydrographic Service (AHS) who will issue a 'Notice to Mariners'.
	OPEP Implementation Santos Mutineer-Exeter Cessation of Production Oil Pollution Emergency Plan developed and maintained for the duration of the cessation of production phase. Oil spill response executed in accordance with the OPEP.

6.14 Unplanned Event - Hydrocarbon Spill from Catastrophic Loss of Wellhead

A summary of the impacts and controls that are in place to manage this hazard is provided in Table 6-15.

6.14.1 Hazard

During the cessation phase, a catastrophic loss of wellhead integrity would result in a subsea release of crude oil to the marine environment.

Wellheads have a substantial roof panel and a debris cap which would offer significant overhead protection from dropped objects (e.g. anchors), and the wellhead structures are rated for a 20 tonne snag load to prevent damage from external interaction. Therefore it would take a significant force to lead to a catastrophic loss of wellhead integrity.

In the extremely unlikely event of a catastrophic loss of wellhead integrity scenario, moderate quantities of crude oil may be released to the marine environment until wellhead integrity can be re-established. Re-establishment of wellhead integrity could take up to 11 weeks if a relief well is required to be drilled.

6.14.2 Potential Impacts

Predicted potential environmental impacts of a crude oil spill are:

- Decline in water quality;
- Toxic effects to the marine environment including marina fauna, shoreline and subtidal habitats;
- Effects on socio-economic receptors (e.g. reduction of aesthetic values, restricted access, loss of income).

6.14.3 Assessment and Management of Impacts and Risks

Stochastic spill modelling undertaken for a catastrophic loss of wellhead integrity at either the Mutineer or Finucane manifolds indicates that marine receptors that are at risk of impact from released hydrocarbons in the extremely unlikely event of a catastrophic loss of wellhead may include:

- Marine fauna including EPBC Act-listed threatened and migratory species (e.g. whales, turtles, fish/sharks and seabirds) from exposure to hydrocarbons.
- Shoreline habitats and associated communities from accumulation of oil reaching shorelines such as mangrove habitats, sandy shores and intertidal flats, rocky shores and intertidal reefs, and adjacent coral reefs, seagrass beds.
- Protected Areas including Australian Marine Parks (Commonwealth) and KEFs from exposure to hydrocarbons (in the water column) and hydrocarbons reaching shorelines (State Marine Parks).
- Commercial fishing grounds may be temporarily closed, which would have an impact on fishermen through loss of income. Market value/ demand for fish may also be impacted due to actual or perceived tainting of catches. The significance of any decrease in market value/demand for fish may be substantial to those few individual fisheries operating in the affected areas, but it is unlikely to cause any significant long-term impact.
- There is a variety of marine and coastal nature-based tourism and recreational activities such as fishing and diving charters in the area that may be affected. In the event of a crude oil spill, there is the potential for temporary closure of marine-based recreational activities (including snorkelling and diving)

to the risk to public health and safety. Restricted access to some shorelines may also be imposed. There would be visual impacts from the stranding of hydrocarbons on shorelines.

- The impact on commercial shipping in the event of a crude oil spill is likely to be limited to the potential for minor modification of shipping routes to avoid the surface oil. Spill response activities may affect shipping operations with the potential for diversions from normal shipping routes to via a 'Notice to Mariners'.
- Indigenous heritage sites may be at risk of impact from predicted hydrocarbons ashore and in the event that shoreline response activities (in particular shoreline clean-up) are initiated.
- Defence activities are not predicted to be affected, given the area that may be affected by surface or in-water hydrocarbons.
- Submerged shipwrecks are not predicted to be affected by surface or in-water hydrocarbons.
- Offshore petroleum operations in the region would likely remain unaffected unless the surface hydrocarbons were considered to represent a safety hazard, at which time the likely response activities would cease production activities. Exclusion zones are likely to be enforced as a safety and navigation precaution measure, thereby restricting large vessels from operating in the area and potentially conflicting with spill response activities. Spill response activities may affect activities, however impacts are predicted to be low.

Table 6-15: Summary of Impacts and Control Measures – Catastrophic Loss of Wellhead

Catastrophic Loss of Wellhead	
Impact	**Control Measure**
Toxic effects to the marine environment including marine fauna, shoreline and subtidal habitats. Effects on socio-economic receptors (e.g. reduction of aesthetic values, restricted access, loss of income).	*Well Operations Management Plan (WOMP)* A NOPSEMA-accepted WOMP in place that includes control measures for well integrity to reduce the risk of an unplanned release of hydrocarbons.
	Navigational Charts Wells and DTM gazetted and marked on navigational charts to minimise the risk of collision from third parties.
	Stakeholder Consultation Relevant stakeholders consulted/ advised of activities prior to commencement of individual inspection/maintenance campaigns. Notification of campaign activities, duration, location, etc., to AMSA's Joint Rescue Coordination Centre for AusCoast warning broadcasts, and to the Australian Hydrographic Service (AHS) who will issue a 'Notice to Mariners'.
	Third Party Agreements and Contracts AMOSC contract and other third party agreements for provision of Subsea First Response Toolkit (SFRT)/equipment/supplies and assistance in the event of a loss of well control incident.
	Third Party Agreements and Contracts Contracts in place with Wild Well Control and OSRL (for provision of well capping stack).
	Third Party Agreements and Contracts

	Through AMOSC contract, Santos has access to AMOSC response function in the event of a hydrocarbon spill, including SFRT.
	Third Party Agreements and Contracts MOU with other Operators for equipment access in the event of a crude oil spill from a catastrophic loss of wellhead integrity incident.
	OPEP Implementation Santos Mutineer-Exeter Cessation of Production Oil Pollution Emergency Plan developed and maintained for the duration of the cessation of production phase. Oil spill response executed in accordance with the OPEP.

7 ONGOING MONITORING OF ENVIRONMENTAL PERFORMANCE

The cessation of production phase of the Mutineer Exeter Development will be managed in compliance with all management measures and controls detailed within the EP accepted by NOPSEMA under the OPGGS(E) Regulations and other environmental legislation, and in accordance with Santos' Management System (SMS).

Santos manages the environmental impacts and risks of its activities through the implementation of the SMS. The SMS provides a formal and consistent framework for all activities of Santos employees and contractors.

Figure 7-1 summarises the framework for the SMS and includes:

- Constitution, Board Charters, Delegation of Authority – These documents define the purpose and authorities of the Santos Limited Board, Board Committees.
- Code of Conduct and Policies – outline the key requirements and behaviours expected of anyone who works for Santos. The Policies are set and approved by the Board.
- Management Standards – prescribe the minimum performance requirements and expectations in relation to the way we work at Santos (the 'What').
- Processes, procedures and tools – support implementation of the Management Standards and Policy requirements by providing detail of 'How' to achieve performance requirements.

The CoP EP contains an Implementation Strategy that describes the Santos systems, practices and procedures in place to manage the activity. The strategy aims to ensure that the control measures, environmental performance outcomes and standards, detailed in the EP and the OPEP, are implemented and monitored to ensure environmental impacts and risks are continually identified and reduced to a level that is ALARP and acceptable. Specifically, the implementation strategy within the CoP EP details:

- Roles and responsibilities
- Training and competencies
- Emergency response
- Management of change (MoC)
- The chemical assessment process
- Incident reporting
- Environmental performance monitoring and reporting.

The Implementation Strategy provides for inducting and training of personnel to ensure they understand the environmental requirements under the EP, and ensure personnel with specific accountabilities are aware of their responsibilities.

Compliance and environmental performance is monitored via a range of measures including audits or inspections. Where a non-conformance or improvement is identified, actions are implemented to correct the non-conformance and prevent reoccurrence. Reportable and recordable incidents resulting from the Activity will be reported to NOPSEMA in accordance with the OPGGS(E)R. Santos will review and report on performance for the Activity described in the EP in the annual Performance Report provided to NOPSEMA.

In the event that a change to the Activity or associated management is proposed, the MoC request is assessed by an Environmental Adviser and if required appropriate technical and/or legal advice is sought. The MoC assessment will be made against the EP and is undertaken to ensure that impacts and risks from the change can be managed to ALARP and acceptable levels. If the proposed change is a significant modification or new stage of activity, introduces a significant new environmental impact or risk, results in a significant increase to an existing environmental impact or risk, or, as a cumulative effect results in an increase in environmental impact or risk, the EP will be revised and submitted for re-assessment and acceptance by NOPSEMA.

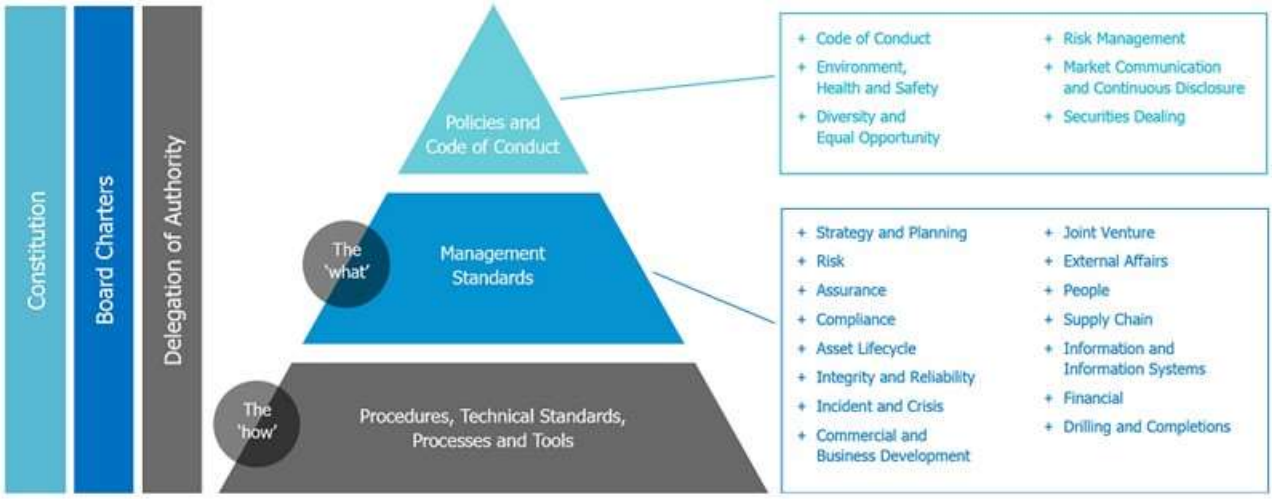

Figure 7-1: Santos Management System Framework

8 OIL POLLUTION EMERGENCY RESPONSE ARRANGEMENTS

The OPEP is the primary reference document and key control measure to implement in the event of an oil spill over the five (5) year duration of the EP. The OPEP establishes the processes and procedures to ensure that Santos maintains readiness to prevent and, if required, respond to and effectively manage oil spill incidents that may occur over the cessation of production phase.

In the event of a hydrocarbon spill, oil spill response strategies will be implemented to endeavour to reduce environmental impacts to ALARP and acceptable levels. The selection of response strategies will be determined through the Net Environmental Benefit Analysis (NEBA) process. The NEBA assesses criteria for each potential spill response strategy, including 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 strategy is evaluated.

The following response strategies may be applicable to the identified credible spill scenarios during the Cessation phase:

- Source control
    - Source control – Vessel spill containment (Shipboard Oil Pollution Emergency Plan [SOPEP]; spill clean-up equipment)
    - Source Control – Well containment
        - Relief well drilling
        - Subsea first response toolkit (SFRT) - Debris clearance tool
        - Capping stack deployment
- Monitor and evaluate
    - Forecast modelling (oil spill trajectory)
    - Surveillance (aerial, vessel and/or satellite)
    - Shoreline assessment
- Mechanical dispersion
- Chemical dispersant application via vessel application (crude oil only)
- Shoreline protection and deflection (crude oil only)
- Shoreline clean-up (crude oil only)
- Oiled wildlife response
- Scientific monitoring.

8.1 Oil Spill Response Resources

Santos has agreements/Mutual Aid Memorandum of Understanding (MOU) with AMOSC/ OSRL and Wild Well Control for the provision of key well control equipment and response equipment/ supplies and assistance in the event of a loss of well control incident.

Response personnel will be resourced from existing Santos staff, established contractors (e.g. Oil Spill Response Ltd [OSRL], Wild Well Control, GHD Pty Ltd) and organisations (e.g. AMOSC), and additional contractors. Untrained labour will be sourced primarily from labour hire providers for shoreline clean-up as required, which can readily provide adequate numbers of personnel to meet Santos' requirements for a staged escalation of several deployments of clean-up teams in the unlikely event this response is invoked.

A MoU in place between Santos and AMSA sets out their respective roles and responsibilities when responding to ship-sourced marine pollution incidents and non-ship sourced marine incidents. AMSA will coordinate resources of the National Plan for Maritime Environmental Emergencies (NatPlan).

Santos will have in place agreements with service providers to meet the capability and scalability needs for spill response. Appropriate contracts and arrangements will be in place prior to commencement of the Activity to implement immediate actions (i.e. first strike response). The first strike (immediate actions) equipment will be utilised as soon as practicable, while further resources (escalation) are assigned and mobilised. Escalation of a spill response relies on membership with AMOSC and OSRL, and the resources of other contracted service providers.

8.2 Preparedness and Implementation of Response Arrangements

Santos and the Vessel Contractors maintain company emergency response plans that cover inspection/maintenance activities to be undertaken for the cessation of production phase. These documents will supplement the NOPSEMA-accepted, program-specific OPEP, which will serve as a stand-alone interface between both companies' spill response plans and the relevant state (WA) and national plans. These relationships are set out in the OPEP.

If a spill occurs from a Level 2 vessel collision or Level 3 catastrophic loss of wellhead, the actual and potential impacts associated with such a spill will be managed in accordance with the procedures set out in the OPEP. Performance outcomes and standards have been developed and are included in the EP and the OPEP for each spill response strategy to provide the basis for the preparation, application, monitoring, termination and reporting of oil spill response arrangements. Smaller fuel and oil spills from vessels will be managed according to the oil spill arrangements and procedures outlined in the vessel SOPEP.

Santos' spill response testing arrangements include an OPEP desk-based exercised, general equipment availability testing, and an EP audit. Through these exercises, personnel will be made aware of their obligations, contracts with third parties (e.g. critical service providers) will be understood and agreements in place (AMOSC, Mutual Aid Agreements) for support will be confirmed including timeframes for implementation as detailed throughout the OPEP. This will aid in the maintenance of a state of readiness and oil spill preparedness.

9 REFERENCES

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