ENVIRONMENT PLAN SUMMARY

ADDENDUM TO
MUTINEER EXETER DEVELOPMENT
FIELD OPERATIONS ENVIRONMENT PLAN

ME-7000-REP-0263

Date	Rev	Reason for Issue	Author	Checked	Approved
28/2/2018	A	For internal review	SF	JE	GH
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2/3/2018	0	Submission to NOPSEMA	SF	JE	GH

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UNITS OF MEASUREMENT

‘	Foot (30 cm)
“	Inch (2.54 cm)
bbl	Barrel (159 litres)
°C	Degrees centigrade
g/m^2	Grams per square metre
cP	Centipoise
dB	Decibels
dB(A)	Decibels A-weighting
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

ALARP	As Low As Reasonably Practicable
AMBA	Area that may be affected
AMSA	Australian Maritime Safety Authority
APPEA	Australian Petroleum Production and Exploration Association
BIA	Biologically Important Area
CoP	Cessation of Production – the period commencing with NOPSEMA acceptance of a CoP EP and continuing until field decommissioning.
DoE	Department of the Environment (former)
DoEE	Department of the Environment and Energy
DoF	Department of Fisheries (WA)
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
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
KEFs	Key Ecological Features
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
ME	Mutineer Exeter Development
MNES	Matter of National Environment Significance
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NWS	North West Shelf
OCNS	Offshore Chemical Notification Scheme
OPGGS (E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OPGGS Act	*Offshore Petroleum and Greenhouse Gas Storage Act 2006*
PSZ	Petroleum Safety Zone
Santos	Santos Pty Ltd
SOPEP	Shipboard Oil Pollution Emergency Plan
SMS	Santos Management System
WAFIC	West Australian Fishing Industries Council

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. Santos has been producing from these fields (the Mutineer Exeter Development) since 2005. Production occurs from a series of subsea wells linked by subsea pipelines via a disconnectable turret mooring (DTM) to a Floating Production Storage and Offloading unit (FPSO).

Commissioning and operation of the facility is undertaken under the *Mutineer Exeter Development Field Operations* (Operations) Environment Plan (EP), accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) in 2014.

Production from the field is declining, with 3 of the 9 production wells already shut in and the average water cut from the field now > 95%. Santos intends to cease (shut in) production from the remaining wells, with the FPSO currently scheduled to depart the field in 2018. The subsea infrastructure will remain in place and the development transition to a 'cessation' phase that will continue until field decommissioning occurs.

To reduce the potential for hydrocarbon leaks from flowlines and umbilicals after production is shut in, Santos plans to flush all remaining well fluids from the system back to the FPSO prior to its departure and fill the pipelines with treated seawater so that the subsea infrastructure will be left 'preserved' on the seabed.

Although similar in nature to the maintenance and intervention activities that have been undertaken during production, the specifics of the flushing/preservation activities and the presence of treated seawater-filled infrastructure remaining on the seabed were not considered by Santos to be adequately described in the existing Operations EP. Accordingly, Santos revised the Operations EP, via Addendum, to describe these activities in detail, to evaluate the associated impacts/risks, and document the controls that will be implemented to ensure all impacts and risks are managed to as low as reasonably practicable (ALARP) and acceptable levels. The revision of the EP (Addendum) was prepared in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS(E)R) and accepted by NOPSEMA on 21 February 2018.

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

1.1 Details of the Titleholder

Santos is the registered titleholder for WA-26-L, WA-27-L and WA-54-L, authorised pursuant to subsection 775B(2) of the Commonwealth OPGGS Act to take eligible voluntary actions on behalf of the titleholders. Table 1-1 provides details of the three titleholders.

Additional information regarding Santos can be obtained from the Santos website at: www.santos.com.

Table 1-1: Titleholder details for WA-26-L, WA-27-L and WA-54-L

Titleholder	ACN	Address
Santos Limited	007550923	Business Address (Head Office): 60 Flinders Street, Adelaide, South Australia 5000
Kufpec (Australia) Pty Ltd	001800924	Business Address: Administrative Shuwaikh – Area 4 – Street 102 – Building No. 9, P.O. Box 5291 Safat, 13053 Kuwait
JX Nippon Oil and Gas Exploration (Australia) Pty Ltd	078323743	Business Address (Head Office): 1-2 Otemachi 1-chome, Chiyoda-ku, Tokyo, 100-8163 Japan

1.2 Nominated Liaison Person Contact Details

The Santos nominated liaison person is:

Name:	Glen Herrera (Manager Operations MEFF)
Business address:	Wesfarmers House, Level 2, 40 The Esplanade, Perth, WA 6000
Telephone number:	(08) 9363 9521
Email address:	glen.herrera@santos.com

2 ACTIVITY DESCRIPTION

2.1 Overview

Flushing and preservation of the subsea infrastructure will be a three stage process, with all stages flushing residual production fluids and chemicals back to the FPSO:

1. Flushing of the Xmas trees (including choke valves) and short jumper spools from the FPSO via the well service lines. Flushing will use treated seawater and these lines will be left preserved with the treated seawater once five volumes of the system have been flushed through.

2. Flushing of the production flowlines using a downline from a (vessel based) pumping spread connected into the system by ROV at three well heads via a choke insert adapter. This will then allow flushing back to the FPSO and for the flowlines to be filled with treated seawater.

3. The hydraulic control umbilicals that contain oil based fluids will also be similarly flushed via a downline attached (using ROV) to the hotstab connection on the umbilical. Again the lines will be left preserved with the treated seawater once the system has been adequately flushed.

All flushing fluids will be captured and treated on the FPSO via the PFW treatment system, before diversion to the slops tank for further treatment (settling) and discharge as required. Recovered hydrocarbons will be added to the onboard crude inventory and separated water (<30 ppm residual OIW) discharged to sea.

The flushing/preservation process is expected to take approximately 7-10 days in total, subject to weather, equipment and/or operational downtime. Flushing is scheduled to commence immediately prior to FPSO departure.

The preserved field infrastructure will then remain on the seabed following departure of the FPSO (with subsequent inspection/intervention activities covered by a separate Cessation of Production [CoP] EP).

2.2 Location

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

The activities covered by the Addendum 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.

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

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 Infrastructure

	Latitude			Longitude		
GDA94, MGA 50	**Degrees**	**Minutes**	**Seconds**	**Degrees**	**Minutes**	**Seconds**
FPSO	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 South manifold	19	18	17.3	116	45	32.9

2.3 Timing

The latest possible date that the flushing/preservation activities will be completed is 4 July 2019. However, the FPSO is expected to depart the field in 2018 and flushing will be completed prior to its departure, and to take approximately 7-10 days to complete, subject to weather, equipment and/or operational downtime. Operations will occur 24 hours per day.

The preserved subsea infrastructure will remain in situ until the operations phase transitions to the cessation phase (with associated inspection/intervention activities covered by a separate CoP EP).

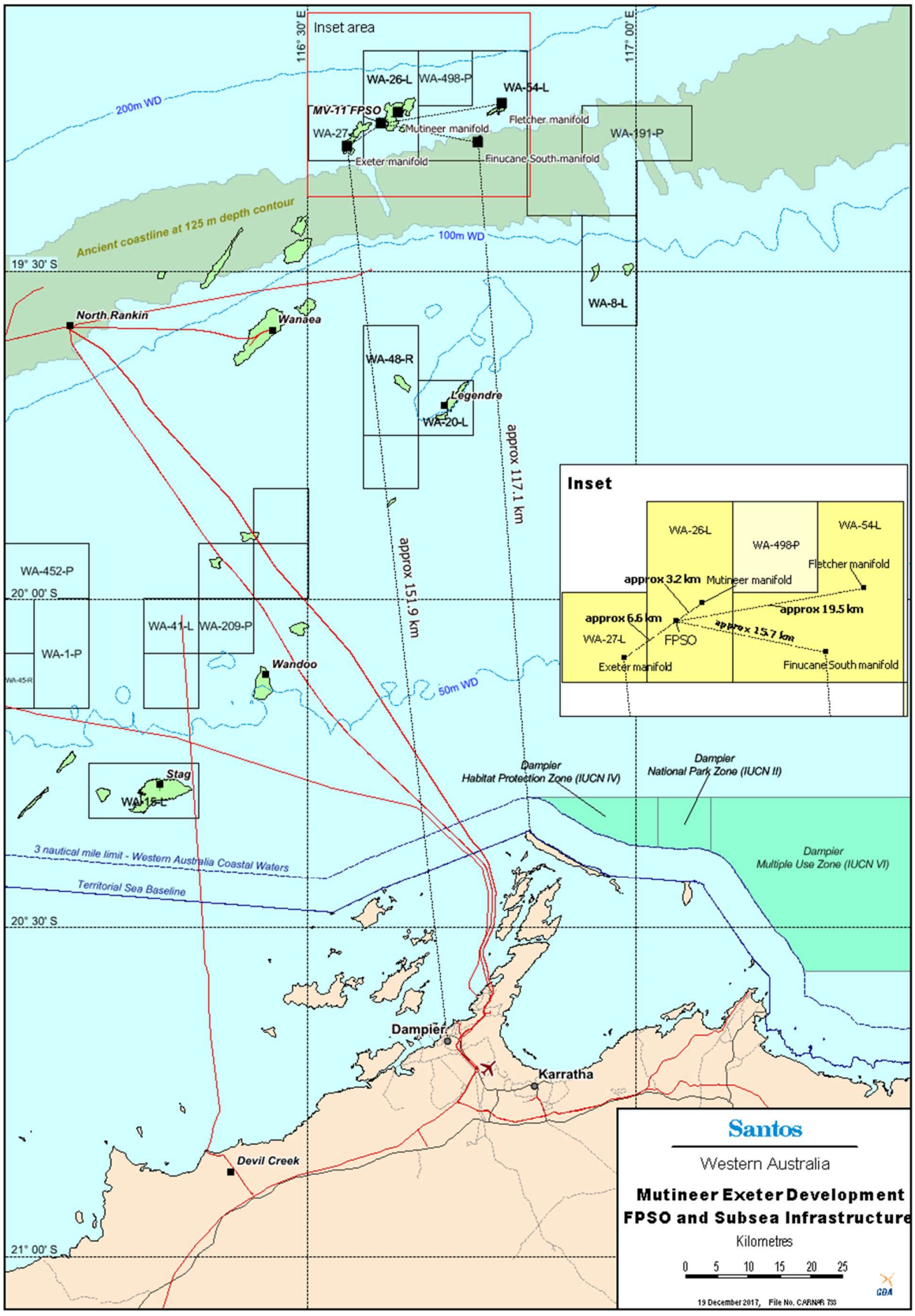
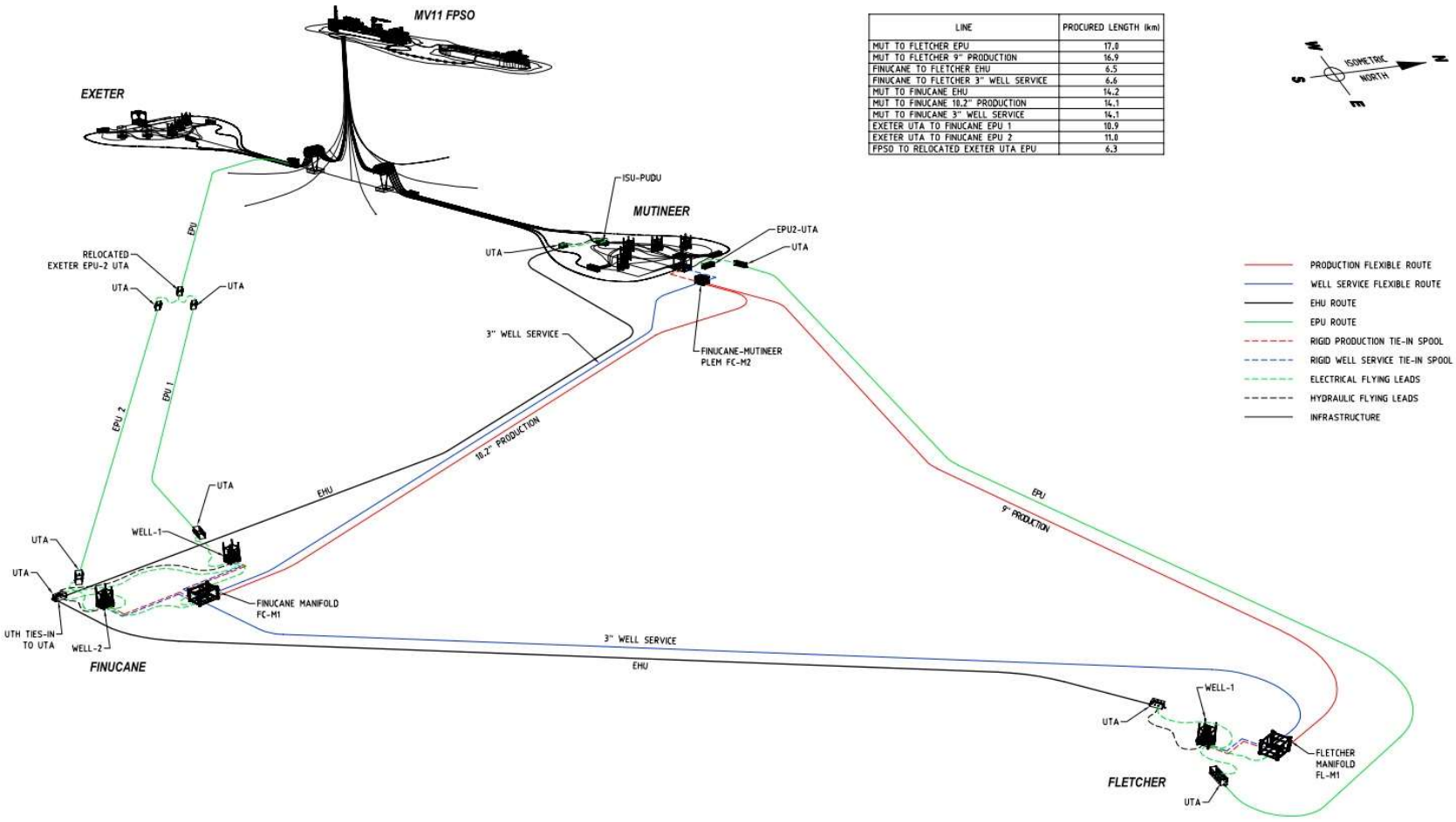


Figure 2-1: Location of the Mutineer Exeter Development Operational Area (Inset) and Facilities



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 Addendum assesses environmental impacts and risks (Section 5) associated with the planned subsea flushing operations described in Section 2 of this document that were not previously described or assessed in the Operations EP. As the Activity does not present any emergency oil spill scenarios not addressed by the Operations EP, the existing environment that may be affected by the planned flushing operations, or unplanned events during these activities, is confined to the operational area described in Section 2. From here on, the environment that may be affected (the EMBA) refers to the operational area.

3.2 Environment That May Be Affected

Consistent with Regulation 13(2) of the OPGGS (E) Regulations, the Addendum:

(a) Describes the existing environment that may be affected (the EMBA) by the activity, as well as any cultural, social and economic aspects of the EMBA; and

(b) Includes details of the particular relevant values and sensitivities (if any) of that environment.

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 (DoEE, 2017a) and the National Conservation Values Atlas (DoEE, 2017b), 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 Habitats

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 in water depths of 130-160 m. 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.

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 Marine Protected Areas and Key Ecological Features

There are no Commonwealth or State Marine Reserves or Management Areas within the EMBA. The nearest Commonwealth Marine Park is the Dampier Commonwealth Marine Park, approximately 115 km south of the operational area.

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 Key Ecological Feature (KEF) occurs within the EMBA (Figure 2-1), the Ancient Coastline at 125 m Depth Contour.

3.2.3 Commercial Fisheries

Commonwealth and State-managed fisheries that have fishing zones that overlap the EMBA are described in Table 3-1. Fisheries status reports (DoF, 2016; ABARES, 2016) and consultation undertaken for this Addendum indicates that potential fishing effort in the EMBA 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 EMBA

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

3.2.4 Tourism and Recreation

Tourism and recreational use, including recreation fishing, is unlikely in the EMBA 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).

3.2.5 Oil and Gas Industry

The EMBA 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.

3.2.6 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 EMBA.

3.2.7 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 EMBA.

3.2.8 Defence

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

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

A search of the EPBC Act Protected Matters Database indicates that 14 species listed as Threatened and Migratory (Table 3-2) may occur in the EMBA. The EMBA does not intercept any critical habitats important for the survival of listed Threatened species. No listed Threatened Ecological Communities or Wetlands of International Importance (Ramsar sites) occur within the EMBA.

The EMBA 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			
Common Name	**Scientific Name**	**Critically Endangered**	**Endangered**	**Vulnerable**	**Migratory**
Listed Threatened Marine Species					
Blue whale	*Balaenoptera musculus*	x	✓	x	✓
Fin whale	*Balaenoptera physalus*	x	x	✓	✓
Humpback whale	*Megaptera novaeangliae*	x	x	✓	✓
Sei whale	*Balaenoptera borealis*	x	x	✓	✓
White shark, great white shark	*Carcharodon carcharias*	x	x	✓	✓
Green sawfish	*Pristis zijsron*	x	x	✓	✓
Whale shark	*Rhincodon typus*	x	x	✓	✓
Flatback turtle	*Natator depressus*	x	x	✓	✓
Green turtle	*Chelonia mydas*	x	x	✓	✓
Hawksbill turtle	*Eretmochelys imbricata*	x	x	✓	✓
Leatherback turtle	*Dermochelys coriacea*	x	✓	x	✓
Loggerhead turtle	*Caretta caretta*	x	✓	x	✓
Red knot	*Calidris canutus*	x	✓	x	✓
Eastern curlew	*Numenius madagascariensis*	✓	x	x	✓
Listed Migratory (only) Marine Species					
Bryde's whale	*Balaenoptera edeni*	x	x	x	✓
Orca, killer whale	*Orcinus orca*	x	x	x	✓
Sperm whale	*Physeter macrocephalus*	x	x	x	✓
Spotted bottlenose dolphin	*Tursiops aduncus* (Arafura/Timor Sea populations)	x	x	x	✓
Narrow sawfish	*Anoxypristis cuspidata*	x	x	x	✓
Shortfin mako	*Isurus oxyrinchus*	x	x	x	✓
Longfin mako	*Isurus paucus*	x	x	x	✓
Reef manta ray	*Manta alfredi*	x	x	x	✓
Giant manta ray	*Manta birostris*	x	x	x	✓
Common noddy	*Anous stolidus*	x	x	x	✓

Value/ Sensitivity		EPBC Act Status			
Common Name	Scientific Name	Critically Endangered	Endangered	Vulnerable	Migratory
Streaked shearwater	*Calonectris leucomelas*	x	x	x	✓
Lesser frigatebird	*Fregata ariel*	x	x	x	✓
Great frigatebird	*Fregata minor*	x	x	x	✓
Common sandpiper	*Actitis hypoleucos*	x	x	x	✓
Sharp-tailed sandpiper	*Calidris acuminata*	x	x	x	✓
Pectoral sandpiper	*Calidris melanotos*	x	x	x	✓
Osprey	*Pandion haliaetus*	x	x	x	✓

3.2.10 Recovery Plans for Listed Threatened Species

Recovery Plans, Conservation Management Plans, Threat Abatement Plans or approved Conservation Advice in place (or in draft) for those EPBC Act listed threatened and migratory species that may occur within the EMBA and were addressed in the Addendum are summarised in Table 3-3.

Table 3-3: Recovery Plans, Conservation Advice and Management Plans for the listed threatened species within the EMBA and management of threats relevant to the activity

Common Name	Recovery Plan/ Conservation Advice / Management Plan	Threats identified as relevant to the activity
Mammals		
Blue whale	Conservation Management Plan for the Blue Whale (DoE, 2015a)	• Noise interference • Habitat modification
Fin whale	Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (TSSC, 2015a)	• Noise interference • Pollution and habitat degradation
Humpback whale	Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) (TSSC, 2015b)	• Noise interference • Habitat degradation
Sei whale	Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (TSSC, 2015c)	• Noise interference • Pollution
Fish/ Sharks/ Rays		
White shark	Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC, 2013)	• Habitat modification
Green sawfish	Sawfish and River Sharks Multispecies Recovery Plan (DoE, 2015) Approved Conservation Advice for Green Sawfish (*Pristis zijsron*) (DEWHA, 2008)	• Habitat degradation and modification
Whale shark	Approved Conservation Advice for *Rhincodon typus* (whale shark) (TSSC, 2015b)	• Habitat disruption form mineral exploration, production and transportation

Common Name	Recovery Plan/ Conservation Advice / Management Plan	Threats identified as relevant to the activity
Reptiles		
Leatherback turtle	Commonwealth Conservation Advice on *Dermochelys coriacea* (DEWHA, 2008)	• Habitat degradation
Flatback turtle	Recovery Plan for Marine Turtles in Australia (DoEE, 2017d)	• Noise interference
Green turtle		
Hawksbill turtle		
Loggerhead turtle		
Birds		
Eastern curlew	Approved Conservation Advice for *Numenius madagascariensis* (eastern curlew) (TSSC 2015e)	• Habitat loss and degradation from pollution

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 Addendum to the Operations EP. Although there are no new or different significant risks or impacts associated with the activities covered by this Addendum, the stakeholder engagement process supporting this revision has addressed all relevant stakeholders.

4.2 Stakeholder Consultation Objectives

The principal objectives of consultation undertaken for the Cessation Addendum and Cessation EP are:

- Confirm relevant stakeholders.
- Continue to maintain open communications between relevant stakeholders and Santos.
- Continue to implement stakeholder engagement tools for Cessation 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 Addendum 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) Regulations 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 Addendum	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) Regulations.
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 submission of the Addendum.
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)	X	No potential marine pollution emergencies associated with the Activity. Support vessel emergencies associated with ME Development addressed in Ops EP.

Stakeholder	Relevant to EP Addendum	Reasoning
Department of the responsible State Minister		
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 Addendum.
North West Slope Trawl Fishery - Cth	X	Advised by WAFIC as not active in the permit area. Based on this information North West Slope Trawl Fishery was assessed as not being a relevant stakeholder for the Addendum.
Western Tuna and Billfish Fishery (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 Addendum.
Kimberley Gillnet and Barramundi Managed Fishery	X	Advised by WAFIC as not active in the permit area as these are Kimberly fisheries. Based on this information Kimberley Gillnet and Barramundi Managed Fishery was assessed as not being a relevant stakeholder for the Addendum.
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 Addendum.
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 Addendum.

Stakeholder	Relevant to EP Addendum	Reasoning
Northern Shark Fishery	X	Advised by WAFIC that the state managed North Shark Fishery is not active in the permit area. AFMA website indicates fishery has been closed since 2009/9. Based on this information Northern Shark Fishery was assessed as not being a relevant stakeholder for the Addendum.
Pearl Oyster Fishery	✓	Advised by WAFIC to consult with the Pearl Producers Association.
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 area.
Pilbara Trawl, Trap and Line Fishery	✓	Advised by WAFIC that the Pilbara Trawl, Trap and Line Fishery may be active in the permit area.
Australian Southern Bluefin Tuna Industry Association	✓	Advised by WAFIC as representing Southern Bluefin Tuna Fishery.
MG Kailis Pty Ltd	✓	Potentially active in the permit area.
EA Morrision and SD Bransby	✓	Potentially active in the permit area.
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 area.
Coyrecup Lake Pty Ltd / Old Brown Dog Pty Ltd	✓	Potentially active in the permit area.
Fat Marine and Glenn Money	✓	Potentially active in the permit area.

Stakeholder	Relevant to EP Addendum	Reasoning
Fresh Fish Shack	✓	Potentially active in the permit area.
RnR Fisheries	✓	Potentially active in the permit area.
Victor and Marie Filippou	✓	Potentially active in the permit area.
Robert and Leigh James Mitchell	✓	Potentially active in the permit area.
Robert and Judith Cooper (Mackerel)	✓	Potentially active in the permit area.
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 Addendum
Mareterram Fisheries Pty Ltd	✓	Potentially active in the permit area.
Haydn Lancelot Webb / Haysito Holdings	✓	Potentially active in the permit area.
Any other person or organisation that the titleholder considers relevant.		
Australian Marine Oil Spill Centre (AMOSC)	X	No potential marine pollution emergencies associated with the Activity. Support vessel emergencies associated with ME Development addressed in Ops EP. Santos is a participating member of AMOSC. In an oil spill AMOSC would provide equipment and support.
Oil Spill Response Limited (OSRL)	X	No potential marine pollution emergencies associated with the Activity. Support vessel emergencies associated with ME Development addressed in Ops EP. Santos has a contract with OSRL. In an oil spill OSRL may provide equipment and support.
Woodside Energy Ltd.	✓	The closest facility to ME is Woodside's unmanned Angel platform. No new developments or activities are proposed by Woodside in 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 will include 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 will include 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 by Murray Baker and no further information was requested.	No unresolved objections or claims made.	No response required.
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 will include 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

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
			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.	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.	No response required
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 Addendum.	No unresolved objections or claims made.	No response required. The Cessation of Production and Decommissioning EPs will include consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Commonwealth Fishing Association (CFA)	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 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.	No unresolved objections or claims made.	No response 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.	No unresolved objections or claims made.	No response required

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
	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.		
Western Tuna and Billfish Fishery - Cth	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 Cessation of Production and Decommissioning EPs will include 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. Though 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 insitu 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 Cessation of Production and Decommissioning EPs will include consultation with stakeholders and address approach and timeframes for dealing with field 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	No unresolved objections or claims made.	No response required. The Cessation of Production and Decommissioning EPs will include 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
	complete removal of the established environment, breeding and feeding areas which have grown around subsea infrastructure.'		
Statewide 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 licenceholder 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 Cessation of Production and Decommissioning EPs will include 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.' 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.'	No unresolved objections or claims made.	No response required
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	Santos emailed this licence holder a ME Cessation Stakeholder Consultation Information Sheet on 24.11.17. No acknowledgement of the Information Sheet was	No unresolved objections or claims made.	No response required.

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
Ltd Westmore Seafoods (Pilbara Trap & Trawl Fishery)	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		The Cessation of Production and Decommissioning EPs will include 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 Cessation of Production and Decommissioning EPs will include 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 licenceholder 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 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.'	No unresolved objections or claims made.	No response required. The Cessation of Production and Decommissioning EPs will include consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
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 licenceholder 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 the EP Addendum on the phone call. No acknowledgement of the Information Sheet was received.	No unresolved objections or claims made.	No response required. The Cessation of Production and Decommissioning EPs will include consultation with stakeholders and address approach and timeframes for dealing with field

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
	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.'		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 Cessation of Production and Decommissioning EPs will include 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 Cessation of Production and Decommissioning EPs will include 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 Cessation of Production and Decommissioning EPs will include consultation with stakeholders and address approach and timeframes for dealing with field infrastructure and associated exclusion zones.
Robert and Judith Cooper (Mackerel	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	No unresolved objections or claims made.	No response required. The Cessation of Production and

Stakeholder	Summary of Consultation	Stakeholder objections or claims	Santos response
Managed Fishery Area 2)	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.'		Decommissioning EPs will include 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 Cessation of Production and Decommissioning EPs will include 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 Department of Mines, Industry Regulation and Safety (DMIRS) of cessation of production and consult during Decommissioning planning.
- Continue to consult with licenced commercial fisheries potentially active in the permit area in regards to decommissioning of infrastructure and removal of associated exclusion zones.
- Continue to consult with Woodside as the operator of Angel platform, the closest asset to the ME Development.
- Notify Australian Hydrographic Service 4 weeks prior to the end of the Cessation phase for the promulgation of related notices to mariners.
- Consult with Department of Primary Industries and Regional Development (DPIRD) - Fisheries Division and RecFish West early in the decommissioning planning phase to ensure its preferred decommissioning outcomes are considered.

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 Addendum. 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 the 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) Regulations. This section describes the environmental impact and risk assessment methods applied.

The assessment results are presented in Sections 6 and 7.

The environmental risk assessment process undertaken for the planned activity comprised the following components that are discussed further in Section 5 as follows:

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 Sections 6 and 7.

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 (AMBA) was determined. Based on the risk assessment undertaken, the AMBA for both planned and unplanned events was determined to fall within the operational area.

5.3 Description of Environment that may be Affected

The environment that may be affected (EMBA) within the AMBA 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 (Appendix 2) was undertaken to identify the environmental values and / or sensitivities with the potential to occur within the AMBA. 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 6 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

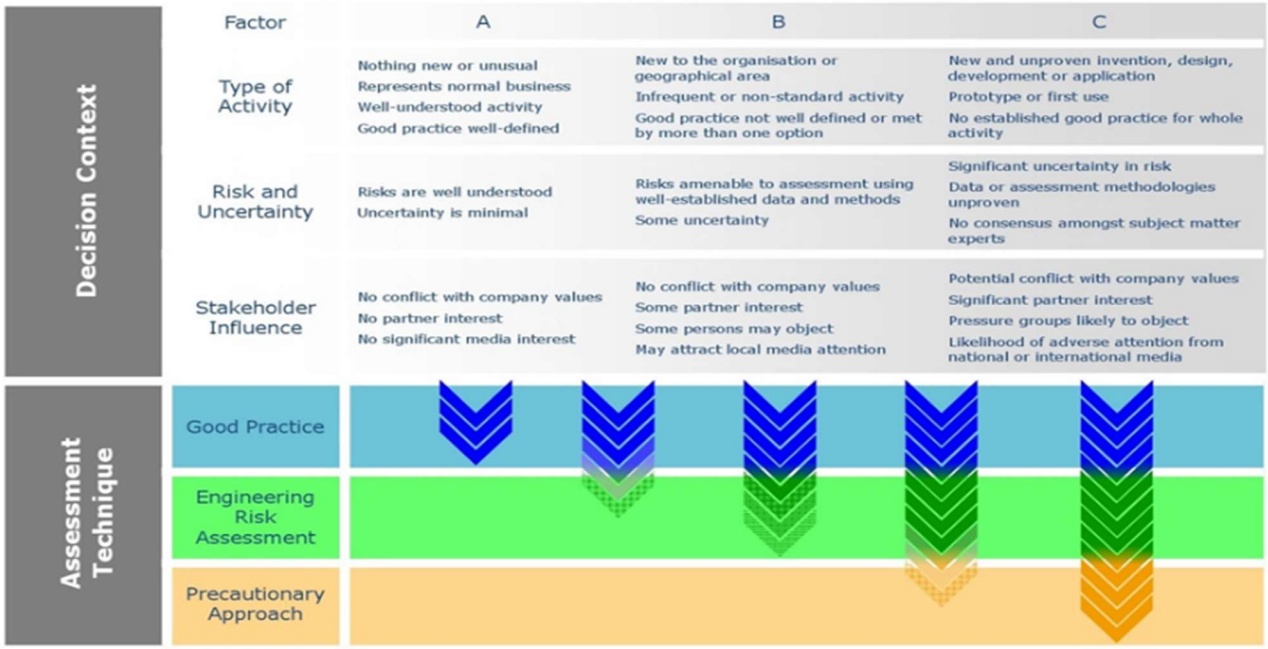


Table 5-1: ALARP Decision Making based upon Level of Uncertainty

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 refueling.
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 Sections 6 and 7.

Table 5-3: Santos Environmental Consequence Classification

Consequence classification	Indicative impact		
	Ecosystems	**Flora and fauna with conservation value**	**Land/water/air**
Critical	Destruction of an area of significant environmental value.	Destruction of / or extensive and long-term impact to an important population of plants or animals with recognised conservation value.	Regional and long-term impact to land or surface or groundwater or air quality. Complete remediation not practical or possible.
Major	Extensive and medium-term impact to areas of significant environmental value.	Extensive and medium-term impact to plants or animals with recognised conservation value.	Extensive and medium-term impact to land or surface or groundwater or air quality. Remediation difficult or expensive.

	Extensive and long-term impact to an ecosystem.		
Moderate	Localised and medium-term impact to areas of significant environmental value. Extensive and medium-term impact to an ecosystem.	Localised and medium-term impact to plants or animals with recognised conservation value.	Localised and medium-term impact to land or surface or groundwater or air quality. Damage can be remediated without long-term impacts. Remediation may be difficult or expensive.
Minor	Localised and short-term impact to areas of significant environmental value. Localised and medium-term impact to an ecosystem.	Localised and short-term impact to plants or animals with recognised conservation value.	Localised and short-term impact to land or surface or groundwater or air quality. Readily treated.
Negligible	Negligible/localised and short-term impact to an ecosystem.	Localised disturbance of plants or animals.	Negligible impact to land or surface or groundwater or air quality. Readily treated.

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

Table 5-4: Planned Impacts Ranking

Impact Consequence Ranking	Residual Risk Level	Treatment Guide
Critical	5	Intolerable
Major	4	May Be Tolerable Subject to ALARP
Moderate	3	
Minor	2	
Negligible	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

Likelihood Categories		Guidance	Supplementary Guidance
Almost Certain	**A**	Is expected to occur often at the location	Occurs daily – weekly
Likely	**B**	Could occur at the location or more frequently in Santos	Occurs monthly
Possible	**C**	Could occur in Santos	Once a year
Unlikely	**D**	Could occur in the worldwide oil and gas industry	Once in 10 years
Remote	**E**	Not expected to occur in the worldwide oil and gas industry	Once in a 100 years

5.9 Risk Matrix

For unplanned events, 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 residual 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

			Consequence				
			Negligible	**Minor**	**Moderate**	**Major**	**Critical**
			I	**II**	**III**	**IV**	**V**
Likelihood	**Almost Certain**	**A**	2	3	4	5	5
	Likely	**B**	1	3	3	4	5
	Possible	**C**	1	2	3	3	4
	Unlikely	**D**	1	1	2	2	3
	Remote	**E**	1	1	1	1	2

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 (See Section 2)
  - Legal and other requirements (See Section 2)
  - Santos policies and standards (See Section 8.1)
  - Stakeholder expectations (See Section 4)

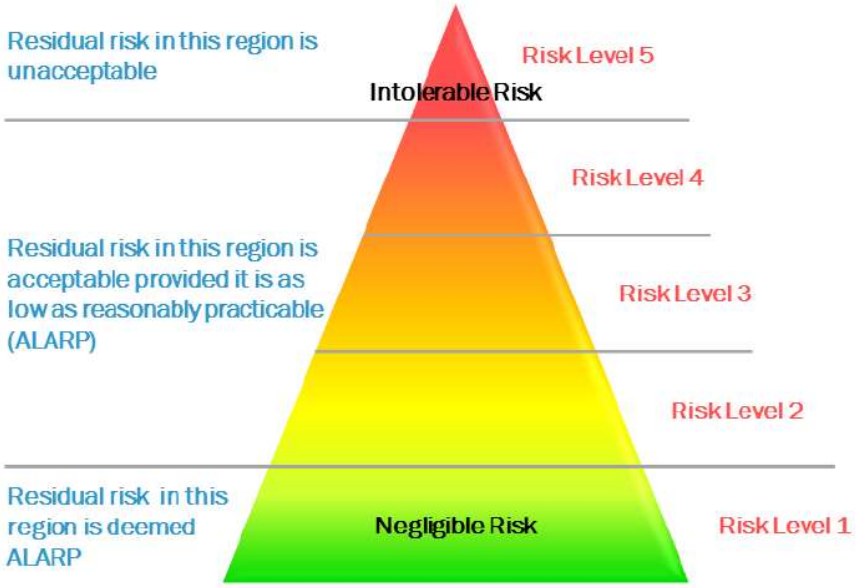


Figure 5-2: Santos Residual Risk Acceptance Model

6 ENVIRONMENTAL IMPACTS AND RISKS

6.1 Summary

The risk assessment identified 6 hazards specifically associated with the planned activities covered by the Addendum (Table 6-1), and two hazards associated with unplanned events that may occur during the planned activities (Table 6-2).

Hazards associated with operation of the FPSO, disconnection and supporting marine activities, including spill risks associated with the FPSO, tankers subsea infrastructure and vessel operations, are addressed in the Operations EP.

All of the hazards associated with planned flushing/preservation activities for the subsea infrastructure were identified to present the potential for only 'Negligible' consequences and assessed as having 'Tolerable' residual risk. Further detail on the assessment of these low order risks, including the controls that will be implemented to ensure their ALARP status and acceptability, is provided in Sections 6.2 to 6.7.

All of the hazards associated with unplanned events during flushing/preservation activities for the subsea infrastructure were identified to present the potential for only 'Negligible' consequences and assessed as having 'Tolerable' residual risk. Further detail on the assessment of these low order risks, including the controls that will be implemented to ensure their ALARP status and acceptability, is provided in Sections 6.8 to 6.9.

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

Hazard	Consequences	Residual Risk
Liquid Discharges	Negligible	Tolerable
Subsea Releases	Negligible	Tolerable
Physical Presence	Negligible	Tolerable
Atmospheric Emissions	Negligible	Tolerable
Noise Emissions	Negligible	Tolerable
Physical Activities (seawater extraction)	Negligible	Tolerable

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

Hazard	Consequence	Likelihood	Residual Risk
Unplanned Liquid Discharges			
Deck spill of treatment chemicals enters marine environment	Negligible	Possible	Tolerable
Release of treated seawater due to failure/disconnection of flushing downpipe	Negligible	Possible	Tolerable
Release of treated water from subsea infrastructure due to physical impact (eg anchor drop)	Negligible	Remote	Tolerable

Unplanned Hydrocarbon Release			
Leak of hydraulic oil from ROV	Negligible	Possible	Tolerable
Release of residual hydrocarbons from subsea infrastructure	Negligible	Remote	Tolerable

6.2 Liquid Discharges

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

During flushing operations, treated seawater (with residual flowline/spool/umbilical fluids) will be returned to the FPSO where it will be treated via the PFW treatment system, before diversion to the slops tank for further treatment (settling) and discharge as required.

6.2.2 Potential Impacts

Discharge of the flushing fluids (including residual hydrocarbons, water-based umbilical fluids and treatment chemicals) will result in a localised and temporary reduction in water quality and may potentially have acute and chronic toxicity to marine life.

6.2.3 Assessment and Management of Impacts and Risks

The discharge of flushing fluids via the FPSO treatment plant during the flushing process will occur at approximately 20% of typical PFW discharge rates during production. Oil in the fluids will be separated in the FPSO PFW treatment system (with diversion to slops tank for further treatment as required) and added to the onboard crude storage tanks prior to discharge of the separated water. The OIW of discharges from the PFW treatment plant is monitored to ensure it remains <30ppm with fluids diverted to the slops tank for further treatment if OIW exceeds this level. Both the PFW and slops tank discharges are monitored to ensure OIW concentrations are below 30 ppm prior to discharge.

All of the treatment chemicals that may be present in the flushing water, including the hydraulic control fluids, have been assessed and approved for marine discharge under the Santos Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001) to ensure they have acceptably low toxicity and bioaccumulation potential.

The discharge point is in an open water, oceanic location and the flushing fluids will be subject to rapid dilution and dispersion following discharge. Modelling of the FPSO mixing zone completed for the Operations EP determined that the largest potential mixing zone extends >5.9 km from the FPSO depending on the season. Monitoring of FPSO discharges during operations did not detect elevated contaminants within ~250 m down-current of the vessel (the closest sample site to the vessel) (GHD 2014). There are no areas of conservation value or critical habitats for fauna species that might be susceptible to adverse effects from the flushing water discharges in this zone or the broader operational area. One KEF, an ancient coastline at 125 m, exists within the broader operational area and FPSO mixing zone, however given that the discharge will be near surface in over 130m of water depth, this feature will not be impacted.

Given the relatively small volumes that will be discharged, the low concentration and/or toxicity and bioaccumulation potential of the chemicals involved, and the very short (approximately 7-10 days) duration of discharge at the oceanic location, the impact was assessed to be Negligible.

Table 6-3: Summary of Impacts and Control Measures – Liquid Discharges

Liquid Discharges	
Impact	**Control Measure**
-Localised temporary decrease in water quality -Localised low toxicity effect to marine flora/fauna	Flushing conducted in accordance with ME Cessation of Production Subsea Flushing Procedure
	All chemicals contained in flushing water approved for marine discharge under Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001)
	Continuous OIW monitor on slops tank (ODME)
	Operation of Oil Discharge Monitoring Equipment Procedure (MOD-000-MV11-PRO-0040)
	Discharges from slops tank managed in accordance with Slops Tank Discharge Procedure – Decanting of Slops Tanks (MOD-000-MV11-PRO-0038_3)

6.3 Subsea Releases

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

Small volumes of hydraulic fluids will be discharged directly to sea when the subsea valves are hydraulically actuated to shut in the 6 remaining production wells and during disconnection of the subsea hydraulic hoses. There will also be a small volume of treated seawater and/or hydrocarbons released when the choke valves are removed to allow the connection of the flushing downpipe.

In the event that the subsea valves are fouled with marine growth, cleaning by water jetting via the ROV may be required. An acidifier may be used to help remove scale deposits.

6.3.2 Potential Impacts

The subsea release of these fluids will result in a localised and temporary reduction in water quality and may potentially have acute and chronic toxicity to marine life.

6.3.3 Assessment and Management of Impacts and Risks

Up to approximately 10L of the control fluid Oceanic HW443 Monoethylene Glycol will be released during operation of each valve. The fluid involved is listed as OCNS D, contains no active ingredients which present a threat to the marine environment, and does not bioaccumulate. It is approved for marine discharge under the Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001) and has been used during production operations under the accepted Operations EP.

During disconnection of the hydraulic leads and removal of the choke valves, less than 10L of treated water and/or hydrocarbons is expected to be released. The hydrocarbons involved may be crude (choke valves) or morlina (umbilicals) and any chemicals in the treated water will be approved for discharge under the Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001). All hydraulic leads have dry break couplings to reduce the volumes of potential release and the choke valves will be subject to flushing via the well service lines prior to removal to reduce the potential for hydrocarbon release.

If marine fouling or calcerous deposits prevent valve actuation, they will be removed through high pressure jetting and, if necessary, the use of an acidification agent (eg citric acid or sulphamic acid). This process may

generate locally and temporarily elevated turbidity and/or a localised and temporary reduction in water quality. The acidification agents will be evaluated under the Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001) to ensure acceptably low marine toxicity and bioaccumulation risk. The cleaning will be a highly targeted process and the volumes of water/chemicals involved will be low (<1m^3).

These subsea releases will occur at the seabed in over 100m of water and be subject to rapid dispersion and dilution in the water column. Given the very low volumes released, the absence of particularly sensitive environmental values in the vicinity and the low toxicity and bioaccumulation potential of the chemicals involved, the impacts are considered to be Negligible.

Table 6-4: Summary of Impacts and Control Measures – Subsea Releases

Subsea Releases	
Impact	**Control Measure**
-Localised temporary decrease in water quality -Localised low toxicity effect to marine flora/fauna	Flushing conducted in accordance with ME Cessation of Production Subsea Flushing Procedure
	All chemicals contained in flushing water approved for marine discharge under Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001)
	Dry break couplings on hydraulic leads connections

6.4 Physical Presence

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

Physical presence hazards are:

- Footprint of the subsea production systems and mooring systems
- Disruption to other users
- Interaction of the ROV and disconnected infrastructure (eg flying leads) with the seabed

The physical presence of the 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 this EP, no new seabed disturbance is expected from the presence of this infrastructure.

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 flushing operations. Infrastructure that is disconnected to facilitate flushing, such as the ends of umbilicals or jumpers, may also contact the seabed.

6.4.2 Potential Impacts

Potential impacts from physical presence during flushing and/or over the preservation period are:

- Seabed disturbance
- Disruption of the activities of other potential users of the area

Seabed Disturbance

Temporary or permanent loss of benthic habitat and associated biota will occur under the footprint of subsea infrastructure, and the presence of subsea infrastructure also has the potential to act as artificial habitat (hard substrate) for the settlement of marine organisms that would not otherwise be successful in colonising the area.

Disruption of Other Users

The presence of the infrastructure on the seabed, and the associated safety exclusion zones, has the potential to locally disrupt the activities of shipping, fishing and recreational users of the area involved.

6.4.3 Assessment and Management of Impacts and Risks

Seabed Disturbance

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 and while some additional sediment erosion/deposition may occur over the short period covered by the Addendum, between the production phase and the cessation phase, this will be insignificant. The scale of effect is very small 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.

Connection/disconnection operations carried out using ROV may cause some localised disturbance to the seabed in the immediate vicinity of the infrastructure, either from the ROV movements and/or if disconnected infrastructure is placed on the seabed. This disturbance will be very small in comparison to the infrastructure footprint (which is in itself small at 1.8 ha). 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 be limited to the immediate vicinity of infrastructure, where there are no benthic habitats of conservation significance.

The consequences of impacts to the seabed are therefore considered to be Negligible.

Disruption of Other Users

The presence of subsea infrastructure will not present a navigation hazard, since the DTM (the shallowest part of the facility) will be lowered to a depth of 30m 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. There are no tourism or recreational activities expected to occur in the area.

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.

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 12 years of operation, nor in the recent invitations to comment.

Table 6-5: Summary of Impacts and Control Measures – Physical Presence

Physical Presence - Seabed Disturbance	
Impact	**Control Measure**
-Damage/loss of benthic habitats -Creation of artificial habitat -Disruption of other uses of the area	Flushing conducted in accordance with ME Cessation of Production Subsea Flushing Procedure
	Contractor selection process requires demonstration of competent, qualified / certified ROV operator
	DTM designed to remain at depths that will not present a navigation hazard during disconnection

	ROV inspection of DTM mooring prior to FPSO sail away
	Location of infrastructure marked with Maritime Safety Zones on maritime charts
	Consultation undertaken consistent with the ME Development Field Operations EP Annual Stakeholder Review (ME-7000-REP-0205)

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

The internal combustion engines associated with the seawater pumping spread and any other mobile/fixed plant and/or equipment required for the flushing activities will generate atmospheric emissions, principally CO_2.

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 activity, the potential for significant impacts is limited.

6.5.3 Assessment and Management of Impacts and Risks

Gaseous emissions quickly dissipate into the surrounding atmosphere under normal circumstances. The flushing and preservation activities will require only a relatively small power source(s), operating for approximately 7 – 10 days (subject to weather, equipment and/or operational downtime). The volumes of emissions will be controlled by limiting the capacity of internal combustion engines to the minimum necessary to optimise the flushing process, and ensuring they are maintained for operating efficiency.

As the flushing activities will occur in offshore waters (150 km from the nearest mainland coastline), the combustion of fuels in this remote location will not impact on air quality in coastal towns or affect any other sensitive receptors. The impact of atmospheric emissions from the vessel-based activities on the marine environment of the region is insignificant. Overall, the combustion emissions will result in a negligible contribution to the global inventory of greenhouse gases.

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

Atmospheric Emissions	
Impact	**Control Measure**
-Greenhouse gas (GHG) emissions -Impact on local air quality	Seawater pump engine(s) maintained in accordance with Contractor Planned Maintenance System
	Contractor Method Statement limits size and number of pumps/engines

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

The engine/pump associated with the seawater flushing spread and any other mobile/fixed plant and/or equipment utilised for the flushing activities may contribute to underwater noise levels. The propulsion (thrusters) on the ROV will also generate underwater noise and low levels of noise may result from the movement of the flushing fluids through subsea infrastructure.

6.6.2 Potential Impacts

The noise levels associated with the flushing activities will not approach levels likely to cause physiological impacts in marine fauna. The known and potential environmental impacts of low level underwater noise emissions are:

- Localised behavioural changes (notably avoidance)
- Increased stress levels
- Disruption to underwater acoustic cues

Due to the very short duration and relatively small scale of the activity, the potential for significant impacts is limited.

6.6.3 Assessment and Management of Impacts and Risks

The extent to which noise emissions associated with surface (onboard) pumping activities are transmitted to the marine environment will depend on the location of the engines/equipment and intensity of the noise source. The pump spread will be located on the vessel deck (rather than the hull) which will reduce its contribution to noise levels underwater. The flushing and preservation activities will require only a relatively small power source(s), operating for approximately 7-10 days (subject to weather, equipment and/or operational downtime). The intensity of noise emissions will be controlled by limiting the capacity of internal combustion engines to the minimum necessary to optimise the flushing process, and ensuring they are maintained for operating efficiency.

Flushing rates will be maintained below operational flow rates within the flow lines to ensure noise levels are not elevated above those experienced during production. The ROV will operate for relatively short periods and any effects on ambient noise levels will be highly localised – there is anecdotal evidence suggesting the noise associated with an operating ROV does not generate avoidance behaviour in local marine life.

There are no critical fauna habitats in the operational area and any effects on noise-sensitive species (notably cetaceans) transiting the area are likely to be limited to very small variations in movements to avoid the immediate vicinity of activity. The infrastructure is not located within the recognised migratory routes of any threatened cetacean species and there are no subsea features in the operational area or surrounding areas that would prevent migratory species making small alterations to their movements.

The noise emissions from the flushing activities are considered to have a Negligible impact on the marine environment of the operational area.

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

Noise Emissions	
Impact	**Control Measure**
Underwater noise generated by Activity changes marine fauna behaviours	Seawater pump engine(s) maintained in accordance with Contractor Planned Maintenance System
	Contractor Method Statement limits size and number of pumps/engines
	Flushing conducted in accordance with ME Cessation of Production Subsea Flushing Procedure

6.7 Physical Activities (Seawater Extraction)

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 seawater flushing spread involves the physical extraction of seawater from the ocean via an inlet hose.

6.7.2 Potential Impacts

The extraction of seawater via an inlet hose associated with the flushing spread has the potential to entrain or impinge marine fauna.

Due to the very short duration (7-10 days) and relatively small scale of the activity, the potential for significant impacts is limited.

6.7.3 Assessment and Management of Impacts and Risks

The extent to which marine fauna may be entrained during seawater extraction depends on the rate of seawater intake and the dimensions and structure of the inlet. High rates of inflow and an unobstructed intake are necessary to generate currents sufficient to entrain/impinge mobile fauna. The generally elevated current speeds in the region (Appendix 3) would tend to counteract this effect for extraction in the operational area, except for brief periods during slack tides.

The inlet for the pumping spread will involve an approximately 6” diameter hose with an oversize screened intake fitting of ~8” (~0.2 m) (Figure 6-1). Pumping rates will be maintained at less than 200m^3/day, generating intake velocities of approximately 0.01 m/s at 0.5 m from the screen (Figure 6-2). The US EPA has determined that if the intake velocity is ≤0.15 m/s, an intake facility has met impingement mortality performance standards (Water Reuse Association, 2011). This impingement mortality standard is met within 10 cm of the screen.

Figure 6-1: Example Intake Fitting

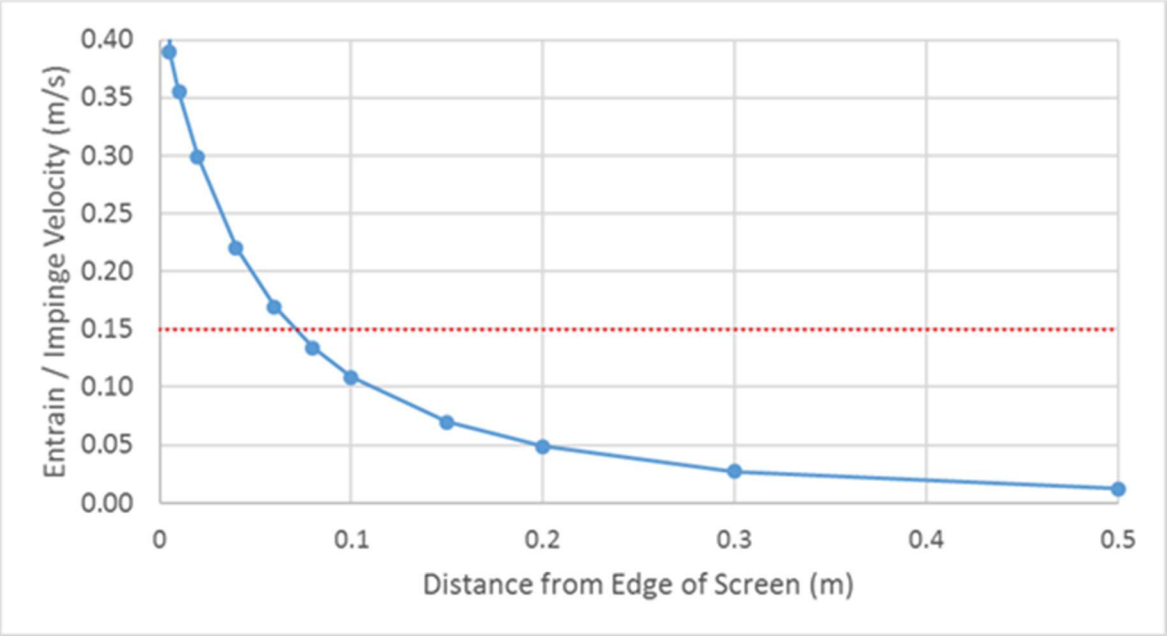


Figure 6-2: Intake velocities with distance from the intake screen

Extraction is expected to be required for only approximately 7-10 days, subject to weather, equipment and/or operational downtime.

There are no critical fauna habitats in the operational area and no features likely to cause fauna aggregations in the vicinity of the intake that may be affected by extraction. Any entrainment of small organisms through the intake screen will be across a very small cross sectional area of the screen normal to the flow of ~8" by 8" (0.2 by 0.2 m). Effects on ubiquitous species of plankton or small fauna transiting the intake location during the short period of extraction are likely to involve an insignificant proportion of regional populations.

Therefore, the impacts from seawater extraction for the flushing activities are considered to have Negligible consequences to marine populations.

Table 6-8: Summary of Impacts and Control Measures - Physical Activities

Physical Activities (Seawater Extraction)	
Impact	**Control Measure**
Entrainment and harm to marine flora/fauna	Contractor Method Statement includes screening and maximum pumping rates

6.8 Unplanned Liquid Discharges

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

Unplanned discharge to the marine environment of the treatment chemicals added to the seawater for flushing and preservation activities could occur through:

- Deck spills that are not contained onboard the vessel
- Failure or disconnection of the flushing downpipe during flushing/preservation activities
- Loss of integrity of subsea infrastructure due to physical impact.

6.8.2 Potential Impacts

The release of treatment chemicals has the potential to cause localised toxic effects on marine fauna and flora (phytoplankton) and a localised reduction in water quality.

6.8.3 Assessment and Management of Impacts and Risks

Deck Spills

The treatment chemicals that may be stored and handled on the vessel during flushing/preservation activities include corrosion inhibitor, surfactants and acidifying agents (citric acid). All chemicals deployed to the field will be subject to assessment and approval for marine discharge under the Santos Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001).

The chemicals are stored in bunded areas and where deck drains are normally maintained closed with scupper plugs or equivalent deck drainage control measures. Spill clean up materials will be available in areas where the chemicals are stored or handled and spills cleaned up immediately. The volumes that might reach the marine environment are therefore likely to be low. A deck spill occurring and resulting in release of chemicals to the marine environment is considered to be Possible.

Flushing Downline Releases

The pumping operation will be subject to continuous monitoring and the pump shut down in the event that the vessel drifts off station (eg from loss of engine power) or the downline hose fails. Nevertheless, in the event that the downpipe lost integrity or became disconnected during pumping of treated seawater, up to approximately 25m^3 of treated water might be released subsea. As the treatment chemicals are approved for marine discharge under the Santos Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001), potential impacts will be highly localised and temporary. The likelihood of release from the downline causing localised toxicity effects to marine life is considered Possible.

Infrastructure Releases

Following departure of the FPSO, the subsea infrastructure will remain on the seabed, preserved with corrosion inhibited seawater. In the extremely unlikely event that the infrastructure was subject to severe physical impact, such as from the dropping of a ship's anchor, there may be unplanned releases/ leaks of the treated seawater to the marine environment. The infrastructure locations are marked on maritime charts with safety exclusion zones, including a 2.5nm radius Cautionary Area around the DTM. The subsea infrastructure is not overpressured and hence the volumes of treated water that would be released to the marine environment in the event of infrastructure damage is low. The probability of a release occurring and causing toxicity impacts to marine life is considered Remote.

The impacts from any of these scenarios would most likely be highly localised and restricted to the immediate area of the release, for the short period until it becomes dispersed and diluted. The chemicals that would be contained in subsea releases of treated water are subject to selection based on the Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001) and the volumes involved would be low. There are no critical fauna habitats in the operational area and pelagic fish, cetaceans and marine reptiles are unlikely to remain in a location affected by a spill for long enough to be exposed to lethal concentrations. Plankton entrained in the spill could be impacted; however, due to the small volumes, and the rapid dilution and dispersal that will result at the oceanic location, the environmental effects will be temporary and localised, and insignificant relative to the widespread distribution of these receptors.

Therefore, the impacts from unplanned liquid discharges are considered to have Negligible consequences to marine fauna and the residual risk is Tolerable.

Table 6-9: Summary of Impacts and Control Measures – Unplanned Liquid Discharges

Unplanned Liquid Discharges	
Impact	**Control Measure**
Localised decrease in water quality and localised toxicity to marine receptors	MARPOL Annex III (Prevention of Pollution of Harmful Substances Carried at Sea in Packaged Form)

	Contractor Planned Maintenance System for flushing equipment
	Offshore Chemical Environmental Risk Assessment Process (0010-650-RIS-0001)
	Consultation undertaken consistent with the ME Development Field Operations EP Annual Stakeholder Review (ME-7000-REP-0205)
	Location of infrastructure marked with Maritime Safety Zones on maritime charts

6.9 Unplanned Hydrocarbon Releases

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

Unplanned release of hydrocarbons to the marine environment could result from damage during handling or subsea operations of the ROV, or in the event that flushing was ineffective and a release of treated seawater from subsea infrastructure contained residual oil.

6.9.2 Potential Impacts

The release of hydrocarbons has the potential to cause localised toxic or oiling effects on marine fauna and flora (phytoplankton) and a localised reduction in water quality.

6.9.3 Assessment and Management of Impacts and Risks

The volume of hydraulic oil on a working class ROV of the type that could be used for the flushing activities is considered to be less than 20 L. Hydraulic oil is highly refined and a spill of this volume would have little potential for oiling impacts. This amount of oil would rapidly disperse at the oceanic location and the potential toxicity impacts would be highly localised and temporary. There are no critical fauna habitats in the operational area or sensitive receptors that would be susceptible to significant impact from this quantity of hydraulic oil. Impacts on plankton or other widely distributed receptors would have Negligible consequences. The likelihood of this event occurring is considered Possible and the residual risk is Tolerable.

The flushing fluids received at the FPSO will be monitored for OIW content. Flushing of the flowlines will continue until the OIW content in returns reduces by <25% with each subsequent volume flush and does not exceed a maximum of 500ppm. If flushing becomes ineffective and cannot reduce OIW content below the 500ppm maximum OIW content criteria, a total of approximately 1030L of oil would remain in the flowlines. Noting that post the flushing the subsea flowlines will be isolated, this separates the remaining total volumes into four separate volumes. The Finucane flowline is the largest volume flowline and at 500ppm would contain 373L of oil.

Following departure of the FPSO, the subsea infrastructure will remain on the seabed, containing corrosion inhibited seawater and minor residual hydrocarbons. In the extremely unlikely event that the infrastructure was subject to severe physical impact, such as from the dropping of a ship's anchor, there may be unplanned releases/ leaks of residual hydrocarbons to the marine environment. The infrastructure locations are marked on maritime charts with safety exclusion zones, including a 2.5nm radius Cautionary Area around the DTM. The subsea infrastructure is not overpressured and fluids that leaked would contain no more than 500ppm OIW. Hence the volume of hydrocarbons that would be released to the marine environment in the event of infrastructure damage is low. The probability of a release occurring and causing toxicity impacts to marine life is considered Remote.

The infrastructure is located in a relatively deep, oceanic location where there are no critical fauna habitats or benthic habitats of conservation significance susceptible to impacts from hydrocarbons. Any release of pipeline fluids would be rapidly dispersed and the OIW content reduced within a short distance of the release site. The associated reduction in water quality would therefore be temporary and localised, with no impacts expected to

conservation significant fauna or flora from toxicity or oiling effects. Impacts on plankton or other widely distributed receptors would have Negligible consequences. The residual risk is therefore considered Tolerable.

Table 6-10: Summary of Impacts and Control Measures – Unplanned Hydrocarbon Releases

Unplanned Hydrocarbon Releases	
Impact	**Control Measure**
Localised decrease in water quality and localised toxicity to marine receptors	Contractor selection process requires demonstration of competent, qualified / certified ROV operator
	Contractor Planned Maintenance System for ROV
	Contractor Method Statement includes ROV pre-dive inspections and recovery to deck for maintenance
	Location of infrastructure marked with Maritime Safety Zones on maritime charts
	Consultation undertaken consistent with the ME Development Field Operations EP Annual Stakeholder Review (ME-7000-REP-0205)
	ME Cessation of Production Subsea Flushing Procedure
	MARPOL Annex I (Prevention of Pollution by Oil) and MARPOL Annex III (Prevention of Pollution of Harmful Substances Carried at Sea in Packaged Form)

7 IMPLEMENTATION STRATEGY

Santos will manage the environmental impacts and risks of the Activity by assuring that operations of the Mutineer Exeter Development are managed in accordance with the Santos EHSMS and its procedures.

The EHSMS of the Mutineer-Exeter Field (referred as Field EHSMS) continually identifies hazards, systematically assesses the risks and eliminates or manages the hazards. Figure 7-1 summarises the Field EHSMS which comprises:

- The Santos Field EHSMS for the Mutineer-Exeter Operations Team in Perth;
- The FPSO HSE and Quality (HSEQ) Management System for operations and activities on the vessel; and
- The EHS Management Plans for key third party contractors.

The EHSMS is a dynamic system that is continuously being improved to ensure it is current and aligned with the changing nature and demands of Santos' business and relevant legislation and Australian Standards. Individual teams and line management are responsible for ensuring EHSMS requirements, plans and systems are implemented and that compliance is verified and documented. Line management is accountable to the Santos management board for overall EHSMS performance for the Mutineer-Exeter Development.

The Addendum contains an Implementation Strategy that describes the Santos systems, practices and procedures in place to manage the environmental risk of the planned activity. The strategy aims to ensure that the control measures, environmental performance outcomes and standards detailed in the Addendum 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 Addendum details:

- Roles and Responsibilities
- Training and Competencies
- Management of Change (MoC)
- Emergency Response
- 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 Addendum, 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) Regulations. Santos will review and report on performance for the Activity described in the Addendum in the annual Operations EP 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 in-force Addendum 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 Addendum will be revised and submitted for re-assessment and acceptance by NOPSEMA.

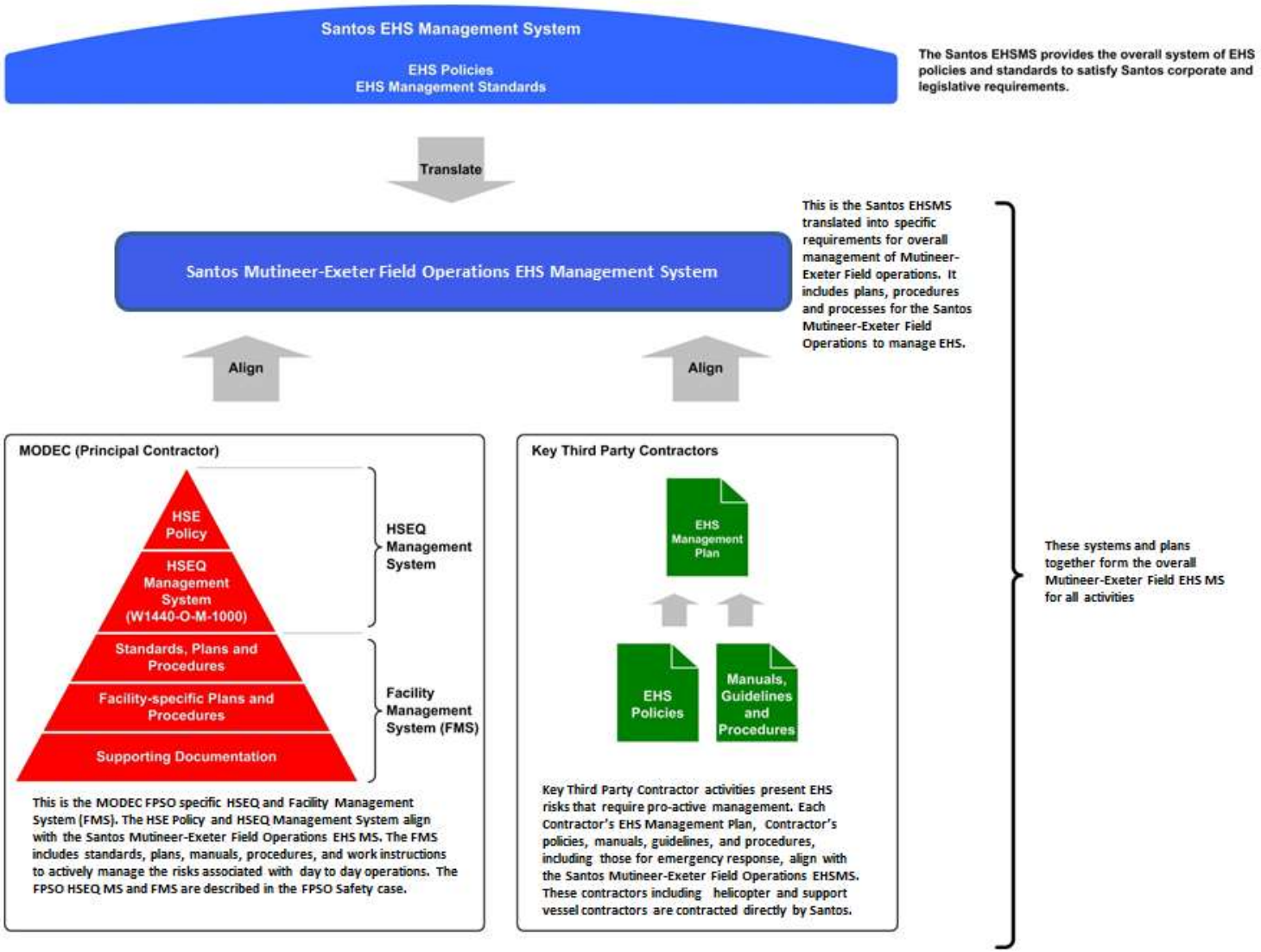


Figure 7-1: Santos Field EHSMS Summary

8 OIL POLLUTION EMERGENCY PLAN

The Operations EP describes the Oil Pollution Emergency Plan for all operations in the Mutineer Exeter field and how it will be implemented in the event of an oil pollution incident. As there are no potential oil pollution emergency events associated with the activities that are not addressed in the Operations EP, the Addendum does not address spill response implementation.

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