Santos

Ningaloo Vision

Cessation of Production and Floating Asset Removal Oil Pollution Emergency Plan

July 2024

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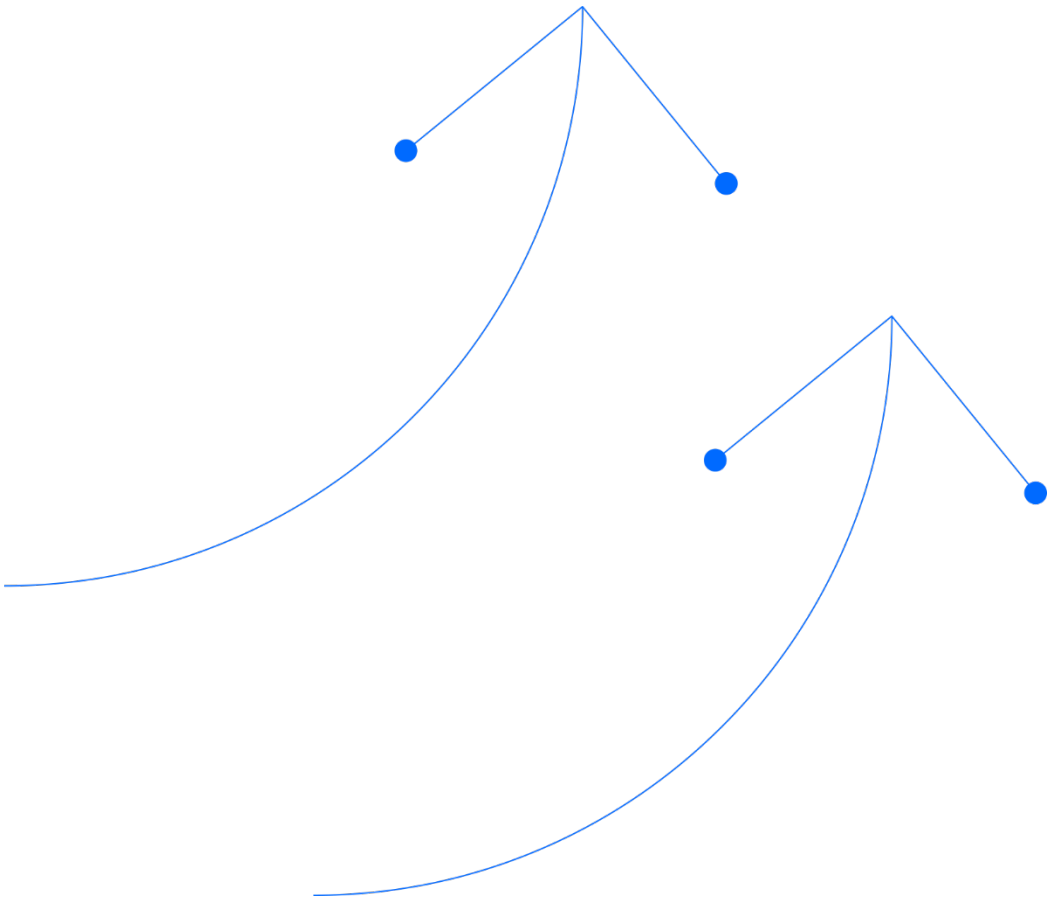

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	Lead Oil Spill Risk and Planning Coordinator	**Manager Environmental – WA, NA & TL** **Principal Oil Spill and Emergency Response Coordinator**	**Senior Manager – Environmental Approvals – WA, NA & TL**
0			

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Rev	Rev Date	Revision
0	31/07/24	For Issue

Distribution	.pdf
Intranet – Emergency Preparedness – both Oil Spill tile & SO ER Documentation	link only
Manager – HSE Offshore Division	link only
Drilling Superintendent	link only
Drilling Supervisor	link only
Senior Oil Spill Response Coordinator	link only
Santos Company Site Representative (CSR)	link only
AMOSC	●
DoT	●
AMSA	●
OSRL	●

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Terms

Term	Definition
AEP	Australian Energy Producers (formerly Australian Petroleum Production and Exploration Association [APPEA]; from 13 September 2023)
AFMA	Australian Fisheries Management Authority
AFR	Aerotech First Response
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre Pty Ltd
AMP	Australian Marine Park
AMSA	Australian Marine Safety Authority
API	American Petroleum Institute
APPEA	Former Australian Petroleum Production & Exploration Association (to 12 September 2023; now Australian Energy Producers [AEP])
BAOAC	Bonn Agreement Oil Appearance Codes
BIP	Bridging Implementation Plan
BER	Boom Encounter Rate
BOP	Blow Out Preventer
BP	Boiling Point
BRUV	Baited Remote Underwater Video
CEO	Chief Executive Officer
CHARM	Chemical Hazard and Risk Management
CMST	Crisis Management Support Teams
CMT	Crisis Management Team
CoP	Cessation of Production
CoPFAR	Cessation of Production and Floating Asset Removal
CSR	Company Site Representative
CTD	Conductivity-Temperature-Depth (meter)
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCMP	Drilling and Completions Management Process
DFAT	Australian Government Department of Foreign Affairs and Trade
DISR	Department of Industry, Science and Resources
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DOR	Dispersant to Oil Ratio
DoT	Department of Transport
DPIRD	Department of Primary Industries and Regional Development
DTM	Disconnectable Turret Mooring
DWER	Department of Water and Environmental Regulation
EHS	Environment, Health and Safety
EMBA	Environment That May Be Affected
EP	Environment Plan
EPS	Environmental Performance Standards

Term	Definition
ER	Emergency Response
ERT	Emergency Response Team
ESC	Environmental Scientific Coordinator
FAR	Floating Asset Removal
FOB	Forward Operating Base
FPSO	Floating Production Storage and Offloading
FSO	Floating Storage and Offloading
FTL	Field Team Leader
FTM	Field Team Member
FWADC	Fixed Wing Aerial Dispersant Capability
GAPA	Government and Public Affairs
GDS	Global Dispersant Stockpile
GIS	Geographic Information System
GPM	Gas Production Manifold
GPS	Global Positioning System
HDPE	High Density Poly Ethylene
HEV	High Environmental Value
HMA	Hazard Management Agency
HQ	Hazard Quotient
HR	Human Resources
HSE	Health, Safety and Environment
IAP	Incident Action Plan
IC	Incident Commander
ICC	Incident Coordination Centre
IHS	Information Handling Services
IMT	Incident Management Team
IR	Incident Response
IWCF	International Well Control Forum
KPI	Key Performance Indicator
KSAT	Kongsberg Satellite Services
LAT	Lowest Astronomical Tide
LMRP	Lower Marine Riser Package
LNG	Liquified Natural Gas
LOWC	Loss of Well Control
MARPOL	International Convention for the Prevention of Pollution from Ships
MCT	Monitoring Coordination Team
MDA	MacDonald, Dettwiler and Associates Ltd
MDO	Marine Diesel Oil
MEECC	Maritime Environmental Emergency Coordination Centre
MEER	Maritime Environmental Emergency Response
MGB	Mobile Garbage Bin
MNES	Matters Of National Environmental Significance

Term	Definition
MODU	Mobile Offshore Drilling Unit
MOP	Marine Oil Pollution
MoU	Memorandum Of Understanding
MSA	Master Services Agreement
N/A	Not Applicable
NATA	National Association of Testing Authorities
NC	No Contact
NEBA	Net Environmental Benefit Analysis
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NSW	New South Wales
NT	Northern Territory
NW	North West
NV	Ningaloo Vision
OCNS	Offshore Chemical Notification Scheme
OEG	OEG Offshore Pty Ltd
OMP	Operational Monitoring Plans
OPEP	Oil Pollution Emergency Plan
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023
OSC	On-Scene Commander
OSCA	Oil Spill Control Agents
OSCP	Oil Spill Contingency Plan
OSM	Operational and Scientific Monitoring
OSM-BIP	Operational and Scientific Monitoring - Bridging Implementation Plan
OSR	Risk Assessment
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling
OWA	Oiled Wildlife Advisor
OWR	Oiled Wildlife Response
P&A	Plug and Abandonment
PLET	Pipeline End Termination
PO	Purchase Order
POLREP	Pollution Report
POWBONS	Pollution of Waters by Oil and Noxious Substances
PPA	Priority Protection Area
PPE	Personal Protective Equipment
PPS	Perth Petroleum Services
PSZ	Petroleum Safety Zone
PW	Produced Water
RA	Risk Assessment
RAT	Rapid Assessment Team
RCC	Rescue Coordination Centre (AMSA)

Term	Definition
ROV	Remotely Operated Vehicle
SA	South Australia
SAR	Satellite Synthetic Aperture Radar / Search and Rescue
SCAT	Shoreline Clean-up Assessment Technique
SCP	Spill Contingency Plan
SCRI	Source Control Response Industry
SFRT	Subsea First-Response Toolkit
SHP-MEE	State Hazard Plan for Maritime Environmental Emergencies
SIMA	Spill Impact Mitigation Assessment
SITREP	Situation Report
SLA	Service Level Agreement
SMART	Specific, Measurable, Appropriate, Realistic and Timely
SME	Subject Matter Expert
SMEEC	State Maritime Environmental Emergency Coordinator
SMP	Scientific Monitoring Plans
SMPC	State Marine Pollution Coordinator
SMPEP	Shipboard Marine Pollution Emergency Plan
SOPEP	Shipboard Oil Pollution Emergency Plans
SRP	Shoreline Response Programme
SSDI	Subsea Dispersants Injection
STR	Shoreline Treatment Recommendations
TBC	To Be Confirmed
TRG	The Response Group
TA	Technical Advisor
TRP	Tactical Response Plan
UAV	Unmanned Aerial Vehicle
UK	United Kingdom
USA	United States of America
VI	Varanus Island
VOC	Volatile Organic Compound
VOO	Vessels Of Opportunity
VP	Vice President
VPO	Vice President Offshore Upstream WA
WA	Western Australia
WAMOPRA	Western Australia Marine Oil Pollution Risk Assessment
WAOWRP	Western Australian Oiled Wildlife Response Plan
WMP	Well Management Plan
WOMP	Well Operations Management Plan
WSP	Waste Service Provider
WWCI	Wild Well Control Inc.
XT	Xmas Tree

1. Quick reference information

<table>
<tr><th>Parameter</th><th>Description</th><th>Further information</th></tr>
<tr><td>Petroleum Activity</td><td>Cessation of production and floating asset removal (CoPFAR) of the Ningaloo Vision facility and subsea infrastructure associated with the Van Gogh, Coniston and Novara Fields.
The petroleum activities include:
The disconnection and sail away of the FPSO from the operational area
The presence of all infrastructure on title and in the water column, including the mooring system up until removal under this Environment Plan (EP), or the field decommissioning phase
Implementation of an inspection regime and maintenance/intervention activities during the CoP period until all wells are plugged and abandoned (subject to future Plug and Abandonment (P&A) EP) and subsea infrastructure is decommissioned (subject to a future decommissioning EP)
Floating asset removal (Disconnectable Turret Mooring (DTM), risers and mooring chains)
Removal of 910 m of damaged production flowline B between DC2 and DC3
Additional flushing of both production flowlines A and B between DC3 and DC4, and DC2 and DC3.</td><td>EP Section 2</td></tr>
<tr><td>Location</td><td>Commonwealth waters, approximately 45 km north-northwest off the Cape Range Peninsula in Western Australia.
The locations of the major infrastructure associated with the Ningaloo Vision CoPFAR are provided in the table below:<table><tr><th rowspan="2">Infrastructure Locations</th><th colspan="2">Coordinates (Datum/Projection: GDA 94 Zone 50)</th></tr><tr><th>Latitude (South)</th><th>Longitude (East)</th></tr><tr><td>FPSO Mooring position</td><td>21°24’12.39”</td><td>114°05’17.22”</td></tr><tr><td>DTM Mooring Point 1 (centred)</td><td>21°23’32.43”</td><td>114°05’08.43”</td></tr><tr><td>DTM Mooring Point 2 (centred)</td><td>21°22’05.43”</td><td>114°05’28.89”</td></tr><tr><td>DTM Mooring Point 3 (centred)</td><td>21°24’39.45”</td><td>114°04’45.24”</td></tr><tr><td>Pipeline End Termination (PLET) for PW reinjection wells 1 & 2</td><td>21°23’50.17”</td><td>114°04’06.23”</td></tr><tr><td>Gas Production Manifold (GPM)</td><td>21°23’51.68”</td><td>114°04’03.86”</td></tr><tr><td>Van Gogh Subsea Production Manifold A (DC 1)</td><td>21° 23’ 51.34”</td><td>114°04’04.75”</td></tr><tr><td>Van Gogh Subsea Production Manifold B (DC 2)</td><td>21°23’12.71”</td><td>114°04’35.91”</td></tr><tr><td>Coniston Subsea Production Manifold (DC 3)</td><td>21˚20’57.29”</td><td>114˚04’23.61”</td></tr><tr><td>Novara Subsea Production Manifold (DC 4)</td><td>21˚20’12.33”</td><td>114˚04’55.95”</td></tr><tr><td>Novara Subsea Guide base post dropped on title at DC 4, during Novara-4H drilling on WA-35-L under the Coniston Novara Phase II Drilling Environment Plan (EA-00-RI-268/1), Revision 2, dated 06/09/2013 (CN EP).</td><td>21˚20’12.33”</td><td>114˚04’55.95”</td></tr></table>Ningaloo Vision CoPFAR operational area is defined as:
A 500 m radius petroleum safety zone (PSZ) that extends around the DTM
A 500 m radius around the DTM anchor spread
500 m around and either side of all other subsea infrastructure.</td><td>EP Section 2.2
Figure 3-1</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Description</th><th>Further information</th></tr>
<tr><td>Petroleum title/s (Blocks)</td><td>WA-35-L (Commonwealth waters)</td><td>N/A</td></tr>
<tr><td>Vessels</td><td>CoPFAR activities will be carried out by at least one primary vessel and may be supported by at least one support vessel. Typically, there will be two vessels in the operational area with a maximum of four at any one time.
The activity may be supported by one or a combination of:
• tugs including anchor handling tugs
• barges
• crew transfer vessel
• heavy lift vessel
• dive support vessel and rescue vessel.</td><td>EP Section 2.6 and 2.8</td></tr>
<tr><td>Water depth</td><td>340-400 m</td><td>N/A</td></tr>
<tr><td>Worst-case spill scenarios</td><td><table><tr><th>Scenario</th><th>Hydrocarbon</th><th>Worst-case volume</th></tr><tr><td>Subsea loss of well control (modelled)</td><td>Van Gogh Crude Oil</td><td>1,255 m^3</td></tr><tr><td>Surface spill involving the FPSO (modelled)</td><td>Marine Diesel Oil (MDO)</td><td>1,519 m^3</td></tr><tr><td>465-day leak from a subsea well</td><td>Van Gogh Crude Oil</td><td>114 m^3</td></tr></table></td><td>Section 6.1</td></tr>
<tr><td>Hydrocarbon properties</td><td>Van Gogh Crude:
Density at 15 °C = 961 kg/m^3
Dynamic viscosity = 662 cP @ 20 °C
API Gravity = 15.7°
Wax content = <5%
Pour point = -15 °C
Oil property classification = Persistent - heavy (Group IV)

MDO:
Density at 15 °C = 843.0 kg/m^3
Dynamic viscosity = 3.9 cst @ 20 °C
API Gravity = 36.4°
Wax content = 0.05%
Pour point = −36 °C
Oil property classification = Persistent - light (Group II)</td><td>Appendix A</td></tr>
<tr><td>Weathering potential</td><td>Van Gogh Crude:
Van Gogh Crude is a heavy crude oil with a relatively high degree of persistence in the marine environment irrespective of environmental conditions. Under moderate winds (5 m/s), approximately 90% of Van Gogh Crude is predicted to remain on the surface after 24 hours. The mass on the surface is predicted to drop to approximately 74% after 7 days, with the decrease evenly balanced between evaporation and decay.

MDO:
Under low winds (1 m/s), 60% of the surface slick is predicted to remain after 120 hours (5 days). Under moderate winds (5 m/s), 40% of the initial surface slick is predicted to remain after 24 hours, decreasing further to ~10% after 48 hours and ~1% after 72 hours. With high winds (10 m/s), the surface slick is predicted to be almost entirely evaporated and dispersed after 12 hours.</td><td>Appendix A</td></tr>
<tr><td>Protection priorities</td><td>Barrow Island, Muiron Islands, Ningaloo Coast North</td><td>Section 6.5</td></tr>
</table>

2. First-strike response actions

If the spill is from a vessel, the initial response actions to major oil spill incidents will be undertaken by the relevant Santos Company Site Representative or Vessel Master (for vessel-based incidents). The On-scene Commander (OSC) is either the Santos Company Site Representative (if present) or Vessel Master for vessel-based incidents. This will be determined during the initial activation stages of the incident.

The initial response actions to major incidents at Ningaloo Vision facilities are outlined within the Ningaloo Vision Emergency Response Plan (TV-22-IF-00005) and are under the direction of the Emergency Commander. This includes site and role-specific information relevant to the initial stages of an incident response including raising the alarm, mustering of personnel and ESD of facility infrastructure. The Ningaloo Vision Emergency Response Plan (TV-22-IF-00005) should be consulted as an overall guide to incident response at Ningaloo Vision facilities, which includes all major incidents additional to oil spills.

For hydrocarbon spills to the environment, the Emergency Commander (Facility OIM) is to contact the on-call IMT Duty Manager in Perth.

If the spill is from a vessel, the initial response actions to major oil spill incidents will be undertaken by the relevant Vessel Master.

Following those initial actions undertaken by the Facility OIM / Vessel Master to ensure the safety of personnel, and to control the source of the spill, the Facility OIM / Vessel Master will assess the situation based on:

- What has caused the spill?
- Is the source under control?
- What type of hydrocarbon has been spilled?
- How much has been spilled?

For spills from support vessels, initial response actions to major incidents are under the direction of the Vessel Master and in accordance with vessel-specific procedures (e.g. Shipboard Oil Pollution Emergency Plans [SOPEPs]).

Response information contained within this Oil Pollution Emergency Plan (OPEP) is concerned primarily with a large scale (Level 2/3) hydrocarbon spill where the Perth-based Incident Management Team (IMT) is engaged for support and implementation of response strategies. Level 1 spills are managed through on-site response and the IMT is available to assist with regulatory requirements/notifications and support if required. Therefore, the immediate response actions listed in Table 2-1 are relevant for any spill.

Once sufficient information is known about the spill, the IMT Incident Commander will classify the level of the spill. If the spill is classified as a Level 1 spill, then the actions related to Level 2/3 spills do not apply, unless specified by the IMT Incident Commander. The Ningaloo Vision Emergency Response Plan (TV-22-IF-00005) and/or Ningaloo Vision Oil Spill First Strike Plan (ERT) V1.0 (both located on the Santos ER SharePoint) should be referred to alongside the first strike activations table below.

Table 2-1: First-strike activations

When (indicative)	Activations		Who
	Objective	Action	
All spills			
Immediate	Manage the safety of personnel	Implement site incident response procedures or vessel-specific procedures, as applicable	Emergency Commander / Vessel Master
Immediate	Control the source using site resources, where possible	Implement site source control procedures (Vessel SOPEP) Refer to source control plan – Section 9	Emergency Commander / Vessel Master
30 minutes of incident being identified	Notify Santos Offshore Duty Manager/Incident Commander	Verbal communication to Offshore Duty Manager/Incident Commander's duty phone	Emergency Commander / Vessel Master
As soon as practicable	Obtain as much information about the spill as possible	Provide as much information to the IMT (Incident Commander or delegate) as soon as possible	Emergency Commander / Vessel Master
60 minutes	Gain situational awareness and begin on-site spill surveillance	Level 1 spills may only require the use of onsite resources to conduct monitor and evaluate activities (e.g. vessel surveillance). Refer to Monitor and Evaluate Plan – Section 10	Emergency Commander / Vessel Master Incident Commander (Perth-based IMT)
Refer to timeframes in Section 7	Make regulatory notifications within regulatory timeframes	Activate the External Notifications and Reporting Procedures – Section 7	Initial notifications by Planning Section Chief – Section 7
Level 2/3 spills (in addition to actions above)			
Immediately once notified of spill (to Incident Commander)	Activate IMT, if required	Notify IMT	Offshore Duty Manager/ Incident Commander
IMT actions (0 to 48 hours)			
Within 90 minutes from IMT call-out	Set up IMT room	Refer to IMT tools and checklists for room and incident log set-up	Incident Commander IMT Data Manager
	Gain situational awareness and set incident objectives, strategies and tasks	Begin reactive Incident Action Planning process Refer to Section 8 Review First-strike Activations (this table)	Incident Commander Planning Section Chief
Refer to timeframes in Section 7	Make regulatory notifications as required Notify and mobilise/put on standby external oil spill response organisations and support organisations, as required	Refer to Section 7	Initial notifications by Planning Section Chief Oil Spill Response Organisations (Australian Marine Oil Spill Centre [AMOSC] and Oil Spill Response Ltd [OSRL]) activation by designated call-out authorities (Incident Commanders/Duty Managers)

When (indicative)	Activations		Who
	Objective	Action	
Refer to timeframes in Section 10	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	Vessel Surveillance (Section 10.1) Aerial Surveillance (Section 10.2) Tracking Buoys (Section 10.3) Oil Spill Trajectory Modelling (Section 10.4) Satellite imagery (Section 10.5)	Operations Section Chief Logistics Section Chief/ Supply Unit Leader Environment Unit Leader
Activate on Day 1 as applicable to the incident	Source control support to stop the release of hydrocarbons into the marine environment. **Degree of IMT support will be scenario-dependent**	Activate the source control plan. Refer to Section 9	Operations Section Chief (Source Control Branch Director as appropriate to scenario) Logistics Section Chief/ Supply Unit Leader
Activate on Day 1 as applicable to the incident Refer to Section 11	Reduce exposure of shorelines and wildlife to floating oil through mechanical dispersion	Activate the Mechanical Dispersion Plan Refer to Section 11	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
Activate on Day 1 as applicable to the incident Refer to Section 17	Assess and monitor effectiveness of response strategies and potential impacts from spill and response	Activate the Operational and Scientific Monitoring Plan Refer to Section 17	Environment Unit Leader Logistics Section Chief/ Supply Unit Leader Operations Section Chief
Activate on Day 1 as applicable to the incident Refer Section 12	Implement containment and recovery tactics to reduce the volume of surface hydrocarbons to reduce contact with protection priorities	Activate the Containment and Recovery Plan Refer to Section 12	Operations Section Chief Logistics Section Chief / Supply Unit Leader
Day 1	Identify environmental sensitivities at risk and conduct operational Net Environmental Benefit Analysis (NEBA)	Review situational awareness and spill trajectory modelling Review strategic NEBA and begin operational NEBA (Section 6.6)	Environment Unit Leader
Day 1	Develop forward operational base/s to support forward operations	Begin planning for forward operations base as per Forward Operations Plan (Appendix O)	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
Day 1	Ensure the health and safety of spill responders	Identify relevant hazards controls and develop hazard register Begin preparation Site Health and Safety Management requirements Refer Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)	Safety Officer
If/ when initiated Refer Section 14	Protect identified shoreline protection priorities	Activate the Shoreline Protection and Deflection Plan Refer to Section 14	Operations Section Chief Logistics Section Chief /Supply Unit Leader

When (indicative)	Activations		Who
	Objective	Action	
			Environment Unit Leader
If/ when initiated Refer Section 16	Prevent or reduce impacts to wildlife	Activate the Oiled Wildlife Response Plan Refer to Section 16	Environment Unit Leader Operations Section Chief Logistics Section Chief/ Supply Unit Leader
If/ when initiated Refer Section 15	Clean-up oiled shorelines	Activate Shoreline Clean-Up Plan Refer to Section 15	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
If/when initiated Refer Section 18	Safely transfer, transport and dispose of waste collected from response activities.	Activate the Waste Management Plan. Refer to Section 18	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
IMT Actions (48+ hours)			
Ongoing	• For ongoing incident management – indicatively 48 + hours – a formal incident action planning process is to be adopted to continue with spill response strategies identified above. An Incident Action Plan (IAP) is to be developed for each successive operational period. • Santos will maintain control for those activities for which it is the designated Control Agency/ Lead IMT. • Depending on the specifics of the spill, the Australian Maritime Safety Authority (AMSA) and/or Western Australia (WA) Department of Transport (DoT) may be relevant Control Agencies (see Section 4.2). • Where another Control Agency has taken control of aspects of the response, Santos will provide support to that Control Agency. Santos' support to WA DoT (for a WA State waters response) is detailed in Section 4.6.1.		Control Agency IMT Santos to provide the following roles to DoT Maritime Environmental Emergency Coordination Centre (MEECC) / IMT for WA State waters response (refer to Table 5-5): • Crisis Management Team (CMT) Liaison Officer • Deputy Incident Controller • Deputy Intelligence Officer • Deputy Planning Officer • Environment Support Officer • Deputy Public Information Officer • Deputy Logistics Officer • Deputy Waste Management Coordinator • Deputy Finance Officer • Deputy Operations Officer • Deputy Division Commander – Forward Operating Base (FOB)

3. Introduction

This document is the accompanying Oil Pollution Emergency Plan (OPEP) to the Ningaloo Vision Cessation of Production and Floating Asset Removal Environment Plan (EP) (7750-650-EIS-0007) required by Regulation 35(4) and Regulation 22(8) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* (OPGGS(E)R).

3.1 Description of activity

Santos proposes to cease production operations in the Ningaloo Vision Operational Area, located in production licence WA-35-L, located wholly within Commonwealth Waters (Figure 3-1).

This OPEP covers the cessation phase of the Ningaloo Vision facilities and floating asset removal. The cessation phase will commence once production has ceased, suspension of operations activities have been completed and the FPSO has departed the field (these activities are covered in the Ningaloo Vision Operations Environment Plan WA-35-L [TV-00-RI-00003.01]). The activities covered by this OPEP include:

- the disconnection and sail away of the FPSO from the operational area
- the presence of all infrastructure on title and in the water column, including the mooring system up until removal under this EP, or the field decommissioning phase;
- implementation of an inspection regime and maintenance/ intervention activities during the CoP period until all wells are plugged and abandoned (subject to a future P&A EP) and subsea infrastructure is decommissioned (subject to a future decommissioning EP);
- floating asset removal (FAR) (DTM, risers and mooring chains).
- removal of 910 m of damaged production flowline B between DC2 and DC3
- additional flushing of both production flowlines A and B between DC3 and DC4, and DC2 and DC3.

The FAR activities will be carried out by at least one primary vessel and may be supported by at least one support vessel. Inspection and maintenance activities are expected to be conducted with one vessel with minimum one ROV.

Refer to Section 2 of the Ningaloo Vision Cessation of Production and Floating Asset Removal EP (7750-650-EIS-0007) for a comprehensive description and timings of the activity.

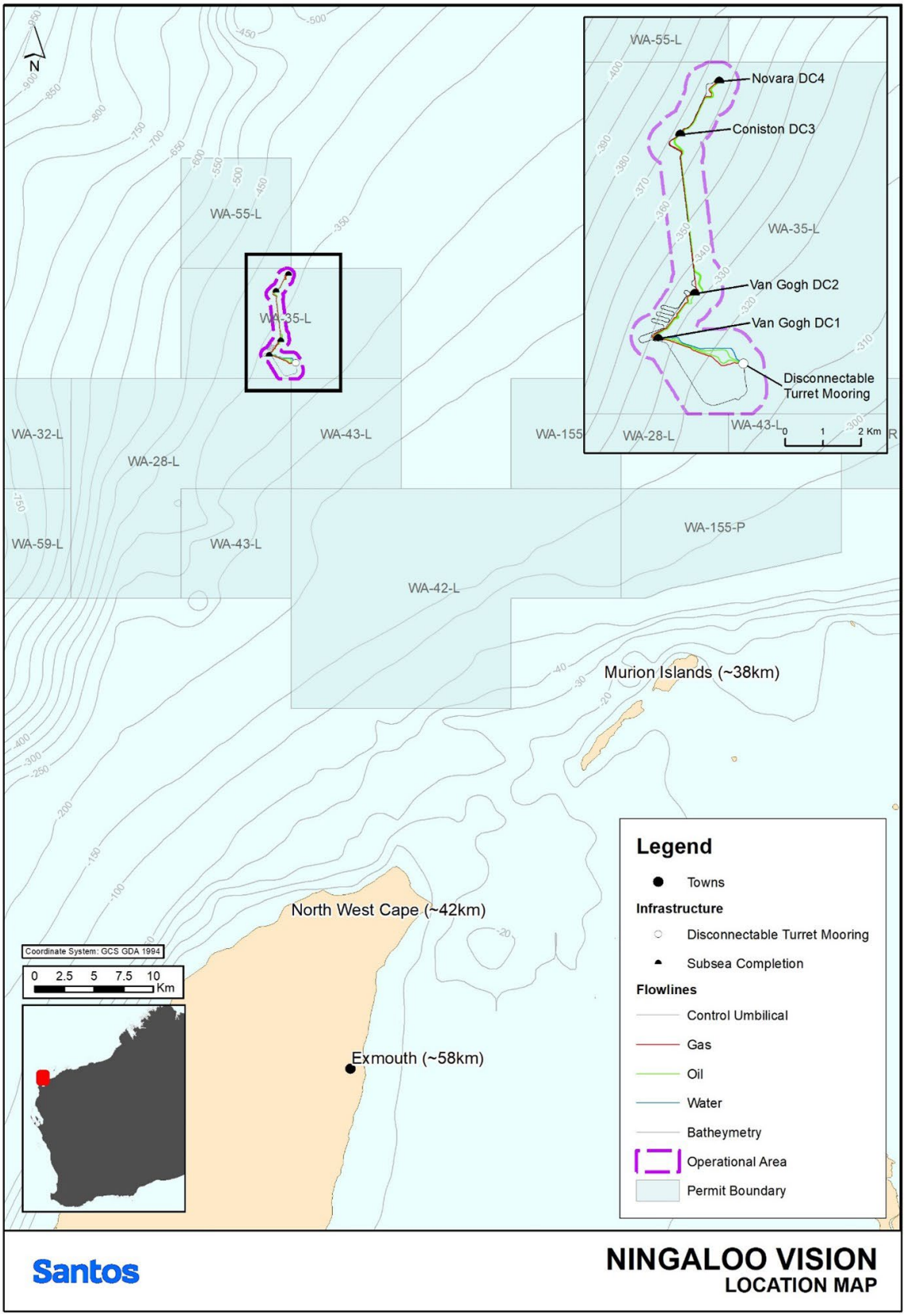

Figure 3-1: Location of the Ningaloo Vision CoPFAR Operational Area

3.3 Purpose

The purpose of this OPEP is to describe Santos' response to a hydrocarbon spill during the CoPFAR activities.

This OPEP has been developed to meet all relevant requirements of the Commonwealth OPGGS(E) Regulations 2023. It is consistent with the National and State (WA) systems for oil pollution preparedness and response, being the National Plan for Maritime Environmental Emergencies (AMSA 2020) managed by AMSA; and the WA State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE) (WA DoT 2023a).

This OPEP is to be read in conjunction with the Ningaloo Vision CoPFAR EP (7750-650-EIS-0007) when considering the existing environment, environmental impacts, risk management, performance standards and the reporting compliance requirements.

This OPEP will apply from acceptance of the EP and will remain valid for the duration of the life of the EP (5 years), as per the revision requirements.

The response strategies outlined in this OPEP have been developed by Santos using risk assessments to identify credible worst-case hydrocarbon spill scenarios, expected/calculated release rates, known information of hydrocarbon types and behaviour, and expected partitioning of the hydrocarbon within the marine environment with an estimate of the volume of persistent oil. This information has been modelled to give a theoretical zone of dispersion that is used to identify potential sensitive receptors and response strategies required to reduce the consequences of a spill to 'as low as reasonably practicable' (ALARP). The response strategies are identified under a net environmental benefit analysis (NEBA) process so the most effective response strategies with the lowest environmental consequences can be identified, documented and prepared for.

3.4 Objectives

The aim of this OPEP is to provide detailed guidance to Santos' IMT, so that it will direct its response effort with the aim of preventing long-term significant environmental impacts by safely limiting the adverse environmental effects from an unplanned release of hydrocarbons to the marine environment to a level that is ALARP. This will be achieved through the implementation of the various strategies and spill response mechanisms presented throughout this OPEP. Through their implementation, Santos will:

- initiate spill response immediately following a spill
- establish source control as soon as reasonably practicable to minimise the amount of oil being spilt into the environment
- assess the spill characteristics and understand its fate in order to be able to make informed and clear response decisions
- monitor the spill to identify the primary marine and coastal resources requiring protection
- remove as much oil as possible from the marine environment while keeping environmental impacts from the removal methods to ALARP
- reduce the impacts of the remaining floating and stranded oil to ALARP
- respond to the spill using efficient response strategies that do not damage the environment themselves
- comply with all relevant environmental legislation when implementing this OPEP
- conduct all responses safely without causing harm to participants
- monitor the impacts from a spill until impacted habitats have returned to baseline conditions
- remain in a state of 'Readiness' at all times for implementation of this OPEP by keeping resources ready for deployment, staff fully trained and completing response exercises as scheduled
- keep stakeholders informed of the status of the hydrocarbon spill response to aid in the reduction of social and economic impacts.

3.5 Area of operation

The Ningaloo Vision DTM, Van Gogh, Coniston and Novara fields are located within Production Licence WA-35-L in Commonwealth waters, approximately 45 km north-northwest off the Cape Range Peninsula in Western Australia (Figure 3-1).

Water depths range from 340 m in the east of the production licence to 400 m in the west, with the DTM located in a water depth of 341 m.

Ningaloo Vision CoPFAR operational area is defined as:

- A 500 m radius petroleum safety zone (PSZ) that extends around the DTM
- A 500 m radius around the DTM anchor spread
- 500 m around and either side of all other subsea infrastructure.

Section 3 of the Ningaloo Vision CoPFAR EP (7750-650-EIS-0007) includes a comprehensive description of the existing environment.

3.6 Interface with internal documents

In addition to this OPEP, a number of other Santos documents provide guidance and instruction relevant to spill response, including:

- Ningaloo Vision Emergency Response Plan (TV-22-IF-00005)
- Ningaloo Vision Oil Spill First Strike Plan (ERT) V1.0
- Santos Incident Management Plan – Upstream Offshore (SO-00-ZF-00025)
- Santos Incident Management Handbook
- Santos Crisis Management Plan (SMS-HSS-OS05-PD03)
- Ningaloo Vision CoPFAR EP (7750-650-EIS-0007)
- Incident Response Telephone Directory (SO-00-ZF-00025.020)
- Refuelling and Chemical Management Standard (SO-91-IQ-00098)
- Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001)
- Oil Pollution Waste Management Plan (7715-650-ERP-0001)
- Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)
- Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017)
- Santos Oiled Wildlife Sample Collection Protocol
- Santos North West Shelf Operational and Scientific Monitoring – Bridging Implementation Plan (OSM-BIP) (7715-650-ERP-0002)
- Oil Spill Scientific Monitoring Baseline Data Review (SO-91-RF-20022)
- Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001)
- Santos Offshore Division Oil Spill Response Readiness Guideline (7710-650-GDE-0001)
- Santos Oil and Water Sampling Procedures (7710-650-PRO-0008)
- Santos Marine Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
- Santos Oil Spill Response – Forward Operating Base Guideline (SO-91-IF-20017).

3.7 Interface with external documents

Information from the following external documents have been used or referred to within this OPEP:

- AMOSPlan – Australian Industry Cooperative Spill Response Arrangements
  - details the cooperative arrangements for response to oil spills by Australian oil and associated industries.
- Offshore Petroleum Incident Coordination Framework
  - provides overarching guidance on the Commonwealth Government's role and responsibilities in the event of an offshore petroleum incident in Commonwealth waters.
- National Plan for Maritime Environmental Emergencies and National Marine Oil Spill Contingency Plan
  - sets out national arrangements, policies and principles for the management of maritime environmental emergencies. The plan provides for a comprehensive response to maritime environmental emergencies regardless of how costs might be attributed or ultimately recovered.

- Western Australia State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE)
  - details the management arrangements for preparation and response to a marine pollution incident occurring in State waters.
- WA DoT Oil Spill Contingency Plan
  - defines the steps required for the management of marine oil pollution responses that are the responsibility of the DoT
  - DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (go to: DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements).
- Western Australia Oiled Wildlife Response Plan
  - establishes the framework for responding to potential or actual wildlife impacts in WA waters, within the framework of an overall maritime environmental emergency
  - outlines risk reduction strategies, preparedness for, response to and initiation of recovery arrangements for wildlife impacts during a marine oil pollution incident.
- Western Australia Oiled Wildlife Response Manual
  - a companion document to the Western Australia Oiled Wildlife Response Plan for Maritime Environmental Emergencies, designed to standardise operating procedures, protocols and processes for wildlife response.
- Joint Industry Operational and Scientific Monitoring Framework
  - provides a standardised approach to oil pollution monitoring, including industry guidance, templates, worked examples and standardised Operational and Scientific Monitoring Plans which titleholders can apply to identify and detail monitoring arrangements and capabilities in their EP and OPEP submissions.
- Shipboard Oil Pollution Emergency Plans
  - under International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements, all vessels of over 400 gross tonnage are required to have a current SOPEP. The SOPEP includes actions to be taken by the crew in the event of an oil spill including steps taken to contain the source with equipment available onboard the vessel.
- OSRL Associate Member Agreement
  - defines the activation and mobilisation methods of OSRL spill response personnel and equipment allocated under contract.
- Australian Government Coordination Arrangements for Maritime Environmental Emergencies:
  - provides a framework for the coordination of Australian Government departments and agencies in response to maritime environmental emergencies.

3.8 Document review

In line with regulatory requirements, this document shall be reviewed, updated and submitted to NOPSEMA every 5 years from date of acceptance.

The document may be reviewed and revised more frequently, if required, in accordance with the Santos Management of Change Procedure (EA-91-IQ-10001). This could include changes required in response to one or more of the following:

- when major changes have occurred that affect oil spill response coordination or capabilities
- changes to the Environment Plan that affect oil spill response coordination or capabilities (e.g. a significant increase in spill risk)
- following routine testing of the OPEP if improvements or corrections are identified
- after a Level 2/3 spill incident.

The extent of changes made to the OPEP and resultant requirements for regulatory resubmission will be informed by the relevant Commonwealth regulations, i.e. the OPGGS(E) Regulations 2023.

The custodian of the OPEP is the Santos Senior Oil Spill Response Coordinator based in the Santos Perth office.

4. Spill management arrangements

4.1 Response levels and escalation criteria

Santos uses a tiered system of three incident response levels consistent with the National Plan for Maritime Environmental Emergencies (National Plan) (AMSA 2020) and the WA SHP- MEE (WA DoT 2023a). Spill response levels help to identify the severity of an oil spill incident and the level of response required to manage the incident and mitigate environmental impacts. Incident response levels are outlined within the Santos Incident Management Plan – Upstream Offshore (SO-00-ZF-00025) and further detailed in Table 4-1 for hydrocarbon spills.

Table 4-1: Santos oil spill response levels

Level 1	
An incident which will not have an adverse effect on the public or the environment which can be controlled by the use of resources normally available on site without the need to mobilise the Santos IMT or other external assistance.	
• Oil is contained within the incident site. • Spill occurs within immediate site proximity. • Discharge in excess of permitted oil in water (OIW) content (15 ppm). • Incident can be managed by the On-site Emergency Response Team (ERT) and its resources.	• Source of spill has been contained. • Oil is evaporating quickly and no danger of explosive vapours. • Spill likely to naturally dissipate. • No media interest/not have an adverse effect on the public.
Level 2	
An incident that cannot be controlled by the use of on-site resources alone and requires external support and resources to combat the situation; or An incident that can be controlled on site, but which may have an adverse effect on the public or the environment.	
• Danger of fire or explosion. • Possible continuous release. • Concentrated oil accumulating in close proximity to the site or vessel. • Potential to impact other installations.	• Level 1 resources overwhelmed, requiring additional regional resources. • Potential impact to sensitive areas and/or local communities. • Local/national media attention/may adversely affect the public or the environment.
Level 3	
An incident which has a wide-ranging impact on Santos and may require the mobilisation of external state, national or international resources to bring the situation under control.	
• Loss of well integrity. • Actual or potentially serious threat to life, property, industry. • Major spill beyond site vicinity. • Significant shoreline environmental impact.	• Level 2 resources overwhelmed, requiring international assistance. • Level 3 resources to be mobilised. • Significant impact on local communities. • International media attention.

4.2 Jurisdictional authorities and control agencies

The responsibility for an oil spill is dependent on location and spill origin. The National Plan for Maritime Environmental Emergencies (AMSA 2020) sets out the divisions of responsibility for an oil spill response. Definitions of Control Agency and Jurisdictional Authority are as follows:

- **Control Agency:** the organisation assigned by legislation, administrative arrangements or within the relevant contingency plan, to control response activities to a maritime environmental emergency. Control Agencies have the operational responsibility of response activities but may have arrangements in place with other parties to provide response assistance under their direction.
- **Jurisdictional Authority:** the agency which has responsibility to verify that an adequate spill response plan is prepared and, in the event of an incident, that a satisfactory response is implemented. The Jurisdictional Authority is also responsible for initiating prosecutions and the recovery of clean-up costs on behalf of all participating agencies.

Table 4-2 provides guidance on the designated Control Agency and Jurisdictional Authority for Commonwealth and State waters and for vessel and petroleum activity spills. To aid in the determination of a vessel versus a petroleum activity spill, the following guidance is adopted:

- In Commonwealth waters, a vessel is a ship at sea to which the *Navigation Act 2012* applies. Defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA 2017) as a seismic vessel, supply or support vessel, or offtake tanker.
- A petroleum activity includes facilities such as a fixed platform, FPSO/FSO, mobile offshore drilling unit (MODU), subsea infrastructure, or a construction, decommissioning and pipelaying vessel, as defined by Schedule 3, Part 1, Clause 4 and Volume 2, Part 6.8, Section 640 of the OPGGS Act 2006.

Table 4-2: Jurisdictional and control agencies for hydrocarbon spills

Jurisdictional boundary	Spill source	Jurisdictional Authority	Control Agency		Relevant documentation
			Level 1	Level 2/3	
Commonwealth waters (three to 200 nautical miles from territorial/state sea baseline)	Vessel[1]	AMSA	AMSA		Vessel SOPEP National Plan Ningaloo Vision CoPFAR OPEP (this document)
	Petroleum activities[2]	NOPSEMA	Titleholder		Ningaloo Vision CoPFAR OPEP (this document)
Western Australian (WA) state waters (State waters to three nautical miles and some areas around offshore atolls and islands)	Vessel	WA Department of Transport (DoT)	WA DoT	WA DoT	Vessel SOPEP State Hazard Plan: Maritime Environmental Emergencies (WA DoT 2023a) WA Incident Management Plan – Marine Oil Pollution (OSCP) (WA DoT 2023b) Ningaloo Vision CoPFAR OPEP (this document)
	Petroleum activities	WA DoT	Titleholder	WA DoT	Ningaloo Vision CoPFAR OPEP (this document) State Hazard Plan: Maritime Environmental Emergencies (WA DoT 2023a)

[1] *Vessels are defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA 2017) as a seismic vessel, supply or support vessel. Note: this definition does not apply to WA State waters.*

[2] *Includes a 'facility', such as a fixed platform, FPSO/FSO, MODU, subsea infrastructure, or a construction, decommissioning and pipelaying vessel. As defined by Schedule 3, Part 1, Clause 4 of the OPGGS Act 2006.*

4.3 Petroleum activity spill in Commonwealth waters

For an offshore petroleum activity spill entering Commonwealth waters, the Jurisdictional Authority is the National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA). NOPSEMA is responsible for the oversight of response actions to pollution events from offshore Petroleum Activities, in areas of Commonwealth jurisdiction. During a spill incident, NOPSEMA's role will be to implement regulatory processes to monitor and secure compliance with the OPGGS Act 2006 and OPGGS (E) Regulations, including the issuing of directions as required, and investigate accidents, occurrences and circumstances involving deficiencies in environment management.

Under the OPGGS Act 2006 and OPGGS (E) Regulations, the petroleum titleholder (i.e. Santos) is responsible for responding to an oil spill incident as the Control Agency in Commonwealth waters, in accordance with its OPEP.

4.4 Vessel spills

AMSA manages the National Plan for Maritime Environmental Emergencies (AMSA, 2020) and is the Control Agency for all vessel-based spills in the Commonwealth jurisdiction. This includes vessels undertaking seismic surveys and associated supply or support vessels.

WA Department of Transport (DoT) manages the SHP – MEE (WA DoT 2023a) and is the Control Agency for all vessel-based spills in WA waters outside of a port proclaimed pursuant to the *Port Authorities Act 1999* (WA). For vessel-based spills within a port proclaimed pursuant to the *Port Authorities Act 1999* (WA), the relevant Port Authority or DoT may be the Control Agency.

In all circumstances, the Vessel Master is responsible for implementing source control arrangements detailed in the vessel-specific SOPEP / SMPEP.

Once initial notifications to the Control Agency are made, Santos shall maintain direct contact with the Control Agency and act as a supporting agency throughout the response. This includes providing essential services, personnel, materials or advice in support of the Control Agency. In addition, Santos will be required to implement monitoring activities as outlined in the Monitor and Evaluate Plan (Section 10) and Operational and Scientific Monitoring (Section 17).

4.5 Cross-jurisdictional spills

4.5.1 Cross-jurisdictional petroleum activity spills

If a Level 2/3 petroleum activity spill crosses jurisdictions between Commonwealth and State waters, the Jurisdictional Authority remains true to the source of the spill (i.e. NOPSEMA for Commonwealth waters; and DoT for State waters unless otherwise appointed through agreement between the Hazard Management Agency (HMA) / Jurisdictional Authority of both waters.

Where a Level 2/3 spill originating in Commonwealth waters moves into State waters, two Control Agencies will exist: DoT and the petroleum titleholder (Santos), each with its own IMT and Lead IMT responsibilities. The arrangements between DoT and Santos for sharing resources and coordinating a response across both Commonwealth and State waters are further detailed in Section 4.6.

4.5.2 Cross-jurisdictional vessel spills

If a Level 2/3 vessel spill crosses jurisdictions between Commonwealth and State waters, two Jurisdictional Authorities will exist: AMSA for Commonwealth waters, and DoT for WA State waters. The Control Agency will remain with the original nominated agency or organisation unless otherwise appointed through agreement between the HMA / Jurisdictional Authority of both waters. Santos will continue to provide all necessary resources (including personnel and equipment) as a supporting agency, as detailed in Section 4.6.

AMSA may request that DoT manage a vessel incident in Australian Commonwealth waters (WA DoT 2023a).

4.6 Integration with government organisations

4.6.1 Australian Maritime Safety Authority

AMSA is the designated Control Agency for oil spills from vessels within Commonwealth jurisdiction. Upon notification to an incident involving a ship, AMSA will assume control of the incident and respond in accordance

with the National Plan (AMSA 2020). AMSA is to be notified immediately of all ship-source incidents through the AMSA Rescue Coordination Centre (RCC) Australia (Santos Incident Response Telephone Directory (SO-00-ZF-00025.020)).

AMSA manages the National Plan, Australia's key maritime emergency contingency and response plan (AMSA 2020). AMSA fulfils its obligations under the National Plan for non-ship source pollution incidents on the formal request from the respective Offshore Petroleum Incident Controller/s (AMSA 2021a). AMSA also has a range of National Plan supporting documents containing related policies, guidance and advisory information.

For any oil pollution event, Santos agrees to notify AMSA immediately in the interests of facilitating the most efficient and effective response to the incident.

4.6.2 Western Australia – Department of Transport

If a Marine Oil Pollution Incident enters, or has the potential to enter, State waters, the DoT is the HMA (DoT Chief Executive Officer or proxy). The Assistant Executive Director (or proxy) has been nominated by the HMA to perform the role of State Marine Pollution Coordinator (SMPC) (as prescribed in Section 1.3 of the SHP – MEE (WA DoT, 2023a)) and DoT will take on the role as a Control Agency. The role of the SMPC is to provide strategic management of the incident response on behalf of the HMA.

For Level 2/3 spills entering or within WA State waters/shorelines, DoT as the Control Agency is the ultimate decision maker regarding identification and selection of protection priorities. DoT will utilise their internal processes which typically includes the following:

- evaluation of situational awareness information, including all surveillance, monitoring and visualisation data provided by the Titleholder
- evaluation of resources at risk including use of the WA Oil Spill Response Atlas and any other relevant WA/Commonwealth government databases or other information sources
- evaluation of shoreline types, habitat types and seasonality of environmental, socio-economic and cultural values and sensitivities
- consultation with the State Environmental Scientific Coordinator and other relevant State and Federal government departments with environmental responsibilities
- consultation with other relevant oil spill agencies, including the AMSA Environment, Science and Technology network or any other experts as necessary
- all information is utilised in a NEBA/ Spill Impact Mitigation Assessment (SIMA) type process, to determine protection priorities and response strategies.

DoT will adjust/amend their internal processes to suit the spill situation at the time.

Santos will notify the DoT Maritime Environmental Emergency Response (MEER) unit as soon as reasonably practicable (within 2 hours of spill occurring) if an actual or impending spill occurs within or may impact WA State waters. On notification, the SMPC will activate their MEECC and the DoT IMT.

For facility oil spills entering State waters (i.e. across jurisdictions) DoT will only assume the role of Control Agency for that portion of the response activity that occurs within State waters, and therefore both Santos and DoT will be Control Agencies. Titleholders will work in partnership with DoT during such instances, as outlined within the DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (WA DoT 2020).

Santos will conduct initial response actions in State waters as necessary in accordance with its OPEP and continue to manage those operations until formal handover of incident control in State Waters is completed. Appendix 1 in DoT's Offshore Petroleum Industry Guidance Note (WA DoT 2020) provides a checklist for formal handover. Beyond formal handover, Santos will continue to provide all necessary resources, including personnel and equipment, to assist the DoT in performing duties as the Control Agency for State Waters.

For a cross-jurisdictional response, there will be a Lead IMT (DoT or Santos) for each spill response activity, noting that DoT only has jurisdictional/control agency authority within State waters.

Appendix 2 in DoT's Offshore Petroleum Industry Guidance Note (WA DoT 2020) provides guidance on the allocation of a Lead IMT to response activities for a cross-jurisdictional spill.

To facilitate coordination between DoT and Santos during a cross-jurisdictional response, a Joint Strategic Coordination Committee will be established. The Joint Strategic Coordination Committee will be jointly chaired between the SMPC and a nominated senior representative of Santos and will ensure alignment of objectives and provide a mechanism for de-conflicting priorities and resourcing requests.

For a cross-jurisdictional response Santos will be responsible for ensuring adequate resources are provided to DoT as Control Agency, initially 11 personnel to fill roles in the DoT IMT or Forward Operating Bases (FOB) (refer to Section 5.2) and operational personnel to assist with those response strategies where DoT is the Lead IMT. Concurrently DoT will also provide two of their personnel to the Santos IMT as described in Table 5-4. Santos' CMT Liaison Officer and the Deputy Incident Controller are to attend the DoT Fremantle Incident Control Centre (ICC) as soon as possible after the formal request has been made by the SMPC. It is an expectation that the remaining initial cohort will attend the DoT Fremantle ICC no later than 8am on the day following the request being formally made to Santos by the SMPC. Santos personnel designated to serve in DoT's FOB will arrive no later than 24 hours after receipt of formal request from the SMPC.

Figure 4-1 shows the organisational structure of Santos incident management personnel within Santos IMT and embedded within DoT's MEECC/ IMT.

Figure 4-2 shows the overall cross-jurisdictional organisational structure referenced from the SHP-MEE.

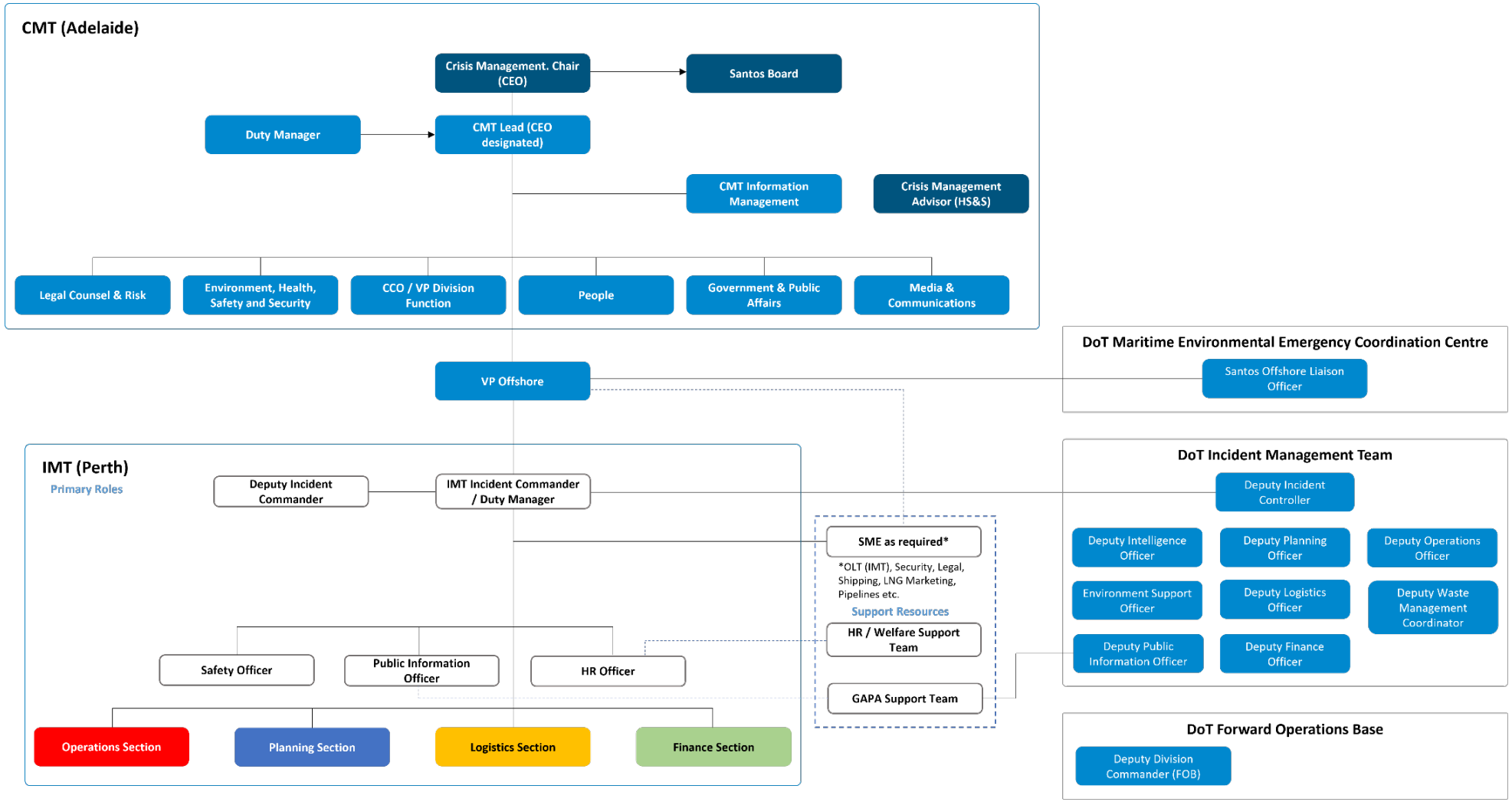

Figure 4-1: Santos cross-jurisdictional incident management structure for a Level 2/3 facility oil pollution incident originating within or entering WA State waters

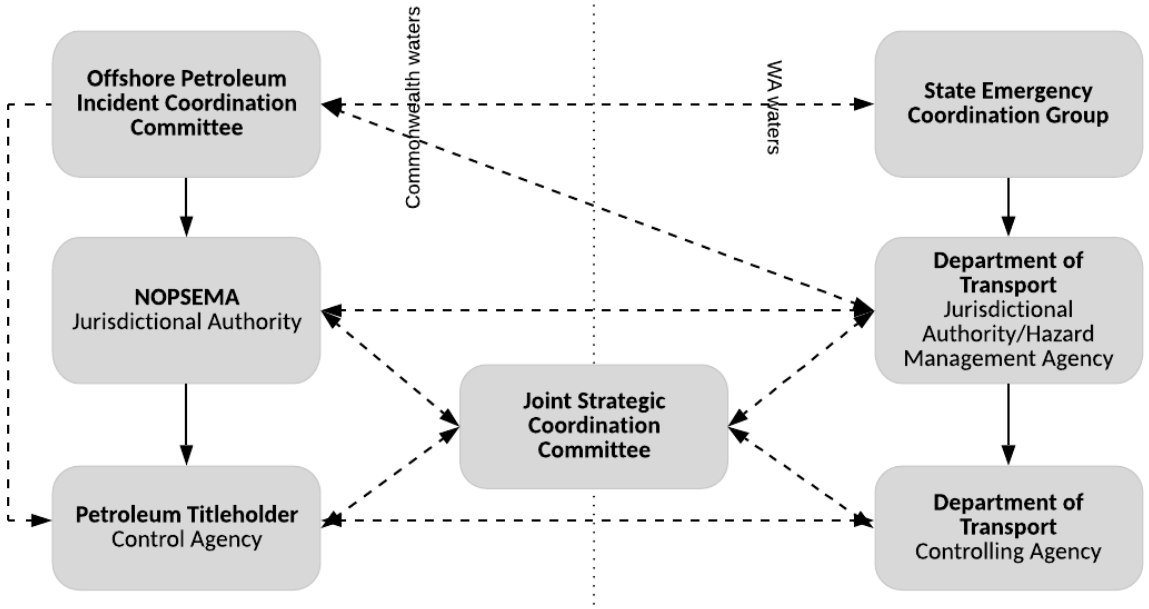

Figure 4-2: Overall control and coordination structure for offshore petroleum cross-jurisdiction incident

4.6.2.1 Consent for use of dispersant in State waters and notification of use in adjacent Commonwealth waters

Approval for the use of dispersant in State waters during an incident shall be pursuant to the DoT Dispersant Use Consent Framework. Administered by DoT, the process will include input from the Environmental Scientific Coordinator (ESC) and require written consent from the HMA/SMPC prior to any dispersant being applied to State waters.

The use of dispersant in Commonwealth waters does not require the consent of DoT. However, where the use of dispersant in Commonwealth waters may impact State waters, the DoT requests early notification.

NOPSEMA's assessment of the OPEP prior to a petroleum activity commencing provides preapproval of dispersant use, where appropriate, and where it avoids any delay which might otherwise limit the window of opportunity available for an effective dispersant strategy (NOPSEMA 2018).

Limitations on surface dispersant application are described further in Section 12.1.2.

4.6.3 Western Australian Department of Biodiversity, Conservation and Attractions

The Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) has responsibilities associated with wildlife and activities in national parks, reserves and State marine parks. The *Biodiversity Conservation Act 2016* (WA) is the legislation that provides DBCA with the responsibility and Statutory Authority to treat, protect, and destroy wildlife. In State waters, DBCA is the Jurisdictional Authority for Oiled Wildlife Response (OWR), providing advice to the Control Agency (DoT). The role of DBCA in an OWR is outlined in the Western Australian Oiled Wildlife Response Plan (WAOWRP) (DBCA 2022a).

For a Level 2/3 petroleum spill that moves into State waters, DoT will be the Control Agency responsible for overall command of an oiled wildlife response. Santos will provide all necessary resources (equipment and personnel primarily through AMOSC membership) to DoT to facilitate this response.

Any deterrence, displacement or rescue activity involving wildlife in WA (living or dead) constitutes "disturbance" or "taking" of wildlife under the Biodiversity Conservation Act 2016 and will require authorisation through DBCA unless undertaken by licensed personnel. The DBCA OWA will expedite the process of granting interim licences or other authorities to undertake approved activities. No action specifically targeted at wildlife should occur without this authority. Deceased animals disposal will be managed in accordance with the DBCA's WAOWRP which describes the process for disposal of dead animals/carcasses. Initially, the granting of authority to take deceased wildlife is likely to be via a direction from a DBCA wildlife officer while the appropriate licences or licence holder/s that the animals can be held by are identified and organised.

For matters relating to environmental sensitivities and scientific advice in State waters DBCA may provide an Environmental Scientific Coordinator (ESC) to support the SMPC and/or DoT Incident Controller.

This may include advice on priorities for environmental protection, appropriateness of proposed response strategies and the planning and coordination of operational monitoring for response effectiveness evaluation, and planning scientific monitoring for impact and recovery assessment. The ESC can also advise on where AMSA

National Plan Dispersant Effectiveness Test Kits can be located, which could be utilised in addition to Santos dispersant testing resources (refer to Section12.4.2).

4.6.4 Department of Industry, Science and Resources

The Department of Industry, Science and Resources (DISR) will be the lead Commonwealth Agency for the provision of strategic oversight and Commonwealth government support to a “Significant” offshore petroleum incident (including oil spill incidents). DISR will be notified by NOPSEMA of a significant oil pollution incident and under the Offshore Petroleum Incident Coordination Framework will stand up the Offshore Petroleum Coordination Committee as the mechanism to provide Commonwealth strategic advice and support to the incident. To facilitate information between the petroleum titleholder IMT and Offshore Petroleum Incident Coordination Committee, Liaison Officer/s will be deployed from DISR to the petroleum titleholder IMT.

For incidents that are classified at a greater level than “Significant” (i.e. crisis level), a whole of government crisis committee will be formed under the Australian Government Crisis Management Framework to provide strategic advice and support and the Offshore Petroleum Incident Coordination Committee will not be convened, although DISR will remain as the lead agency.

4.7 Interface with external organisations

Santos has contracts in place enabling access to Oil Spill Response Organisations (OSROs). OSROs have put specific measures in place to ensure that they are able to continue to meet their commitments to members. This support can be provided directly or remotely to aid the IMT and/or ERT.

4.7.1 Australian Marine Oil Spill Centre

Santos is a Participating Member of AMOSC and as such has access to AMOSC’s equipment and personnel as outlined in the AMOSPlan (AMOSC 2021).

AMOSC has contracts with all its member companies to enable the immediate release of Core Group personnel to be made available for any Santos requirements, as outlined in Santos’ *Master Service Contract* and *Principle and Agency Agreement* with AMOSC.

The mutual aid arrangements that AMOSC operates under are collaborated under the AMOSPlan and are activated via the AMOSC Duty Officer. This provides the mechanism for members of AMOSC to access oil spill response capability of other members. To further enhance the mutual aid arrangements, Santos, Chevron, Woodside and Jadestone have signed a memorandum of understanding (MoU) that defines the group’s mutual aid arrangements. Under this MoU, Santos, Chevron, Woodside and Jadestone have agreed to use their reasonable endeavours to assist in the provision of emergency response services, personnel, consumables and equipment.

4.7.2 Oil Spill Response Limited

Through an associate membership, Santos has access to spill response services from OSRL with offices in Perth, Singapore, UK and at other various locations around the globe. In the event of a Level 2/3 response, Santos could access OSRL’s international personnel, equipment and dispersants to supplement resources available within Australia. Santos may also call on OSRL for technical services to support its IMT.

Under the OSRL Associate membership Service Level Agreement (SLA), Santos has access to response personnel (18 personnel per incident) and 50% of the global response equipment stockpile.

In addition to this, Santos is also a member of OSRL’s Global Dispersant Stockpile (GDS) Supplementary Agreement and Operational and Scientific Monitoring (OSM) Supplementary Services. The GDS Supplementary Agreement provides Santos with access to 5,000 m^3 of dispersant stockpile in addition to the dispersant stockpile available under the Associate membership SLA. The OSM Supplementary Services provides Santos with access to Operational and Scientific monitoring services. Additional information on OSM services and capability is provided in the Santos North West Shelf OSM-BIP (7715-650-ERP-0002).

4.7.3 Wild Well Control

Santos maintains a contract with Wild Well Control Inc. (WWCI) for well control specialist services including relief well drilling and capping stack deployment. WWCI maintains well control response teams on standby at all times to ensure a rapid response to a well control event anywhere in the world. WWCI maintains an inventory of well control, firefighting, and special services equipment at its Houston headquarters and at other locations in the US and internationally.

4.7.4 The Response Group

The Response Group (TRG) is an international provider of crisis management and emergency response services including oil spill response. TRG are available to Santos 24/7 and can provide personnel for emergency response support.

5. Santos incident management arrangements

5.1 Incident management structure

-/The Santos IMT (Perth) and Crisis Management Team (CMT) will be activated in the event of a Level 2/3 hydrocarbon spill regardless of the type of spill or jurisdiction. Santos maintains internal resources (trained personnel and equipment) across its activities that provide first strike response capability and to also support an ongoing response. Should an incident occur, the IMT Duty Manager would be notified immediately. This rostered role is on-call, filled by trained Incident Commanders and available 24 hours/day and 7 days/week. The IMT Duty Manager would then activate the IMT via an automated call-out system. Documentation required in a response is accessed via the Santos Emergency Response (ER) intranet site.

As outlined in Section 4, control of the response may be taken over by the relevant Control Agency as the incident progresses. The Santos response structure to a major emergency incident is detailed in the Santos Incident Management Plan – Upstream Offshore (SO-00-ZF-00025) and the Santos Incident Management Handbook. The Incident Management Plan – Upstream Offshore and Santos Incident Management Handbook describe response planning and incident management that would operate under emergency conditions – describing how the Santos IMT operates and interfaces with the CMT and external parties.

The first priority of an escalating oil spill response to a Level 2/3 spill is forming an IMT and establishing an incident coordination centre (ICC)[3]. The ongoing involvement of the IMT and CMT will depend on the severity and type of spill and the obligations of Santos and other agencies/authorities in the coordinated spill response.

Santos' incident response structure relevant to Ningaloo Vision CoPFAR incident includes:

- ERT
- Santos IMT – Perth-based ICC to coordinate and execute responses to an oil spill incident
- Santos CMT – to coordinate and manage threats to the company's reputation and to handle Santos' corporate requirements in conjunction with the Perth-based Santos – Vice President Offshore Upstream WA
- Other field-based command, response and monitoring teams for implementing strategies outlined in the OPEP.

The Santos incident response organisational structure is defined in the Incident Management Plan – Upstream Offshore and Santos Incident Management Handbook (see also Figure 5-1). The Santos IMT roles and field-based teams are scalable; roles can be activated and mobilised according to the nature and scale of the incident response.

If the incident involves a LOWC, the Santos Source Control Branch would also be included in the incident response structure. This team would comprise the following sub-teams, according to the applicable source control strategies:

- Relief Well Team
- Well Intervention Team.

The Santos Source Control Branch (Figure 5-1) reports directly to the Operations Section Chief and is responsible for:

- coordinating engineering safety and operational activities
- managing source control technical personnel from third parties (e.g. Wild Well Control)
- developing task-specific plans and procedures
- identifying and sourcing required tools and equipment
- approving source control components of IAPs.

In the event of a Level 2 or 3 spill event, Santos will review the relevant persons identification process described in Section 4.2 of the Ningaloo Vision CoPFAR EP (7750-650-EIS-0007). Relevant persons, whose functions, interests or activities that may be affected by the spill event or response arrangements will be identified and engaged in accordance with the Santos incident management process, noting notification and communications requests made by Relevant Persons during EP consultation with respect to emergency situations.

[3] *The Santos ICC is located in the Santos WA Perth office.*

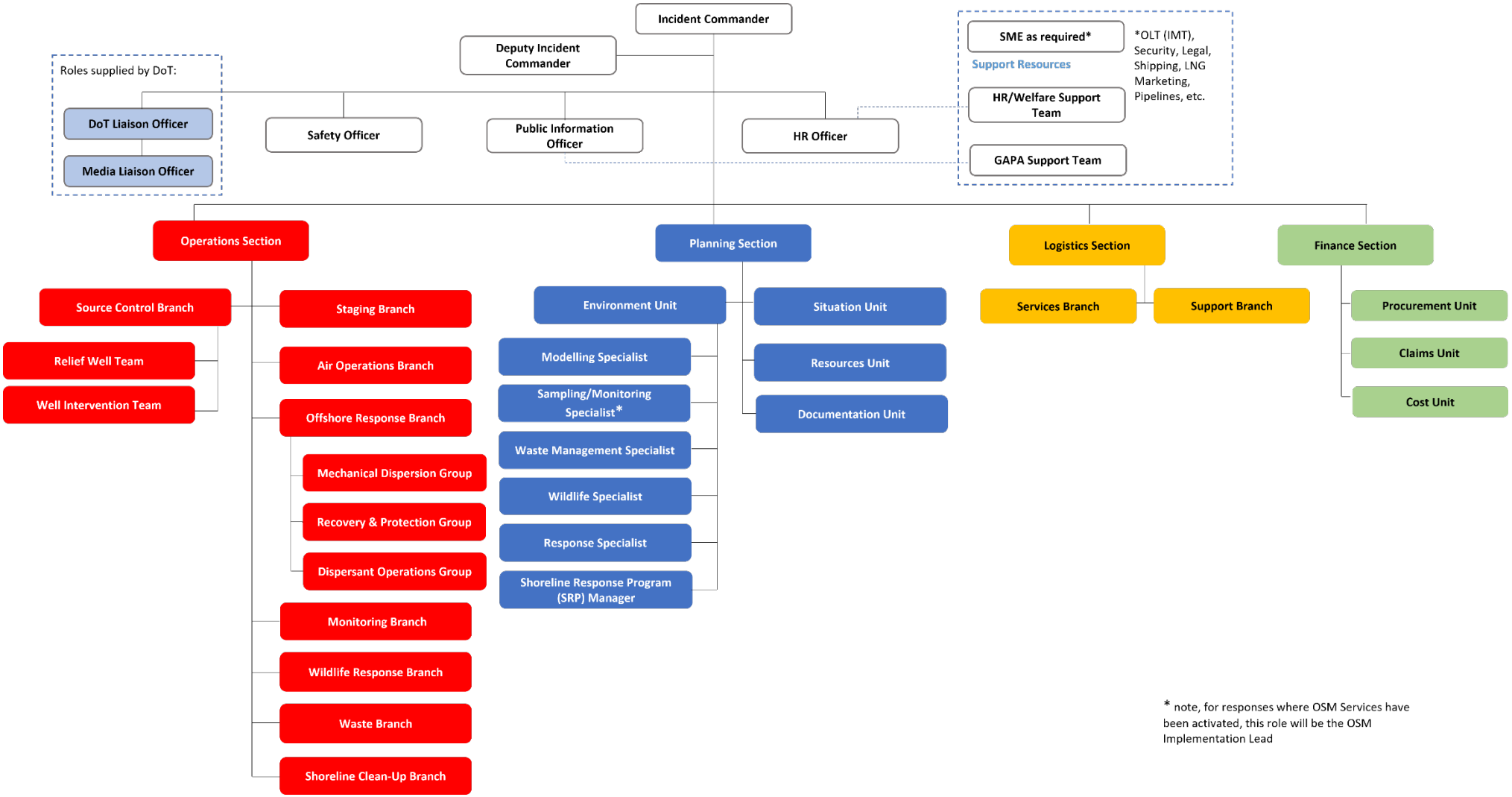

Figure 5-1: Santos incident management team organisational structure

Note: For a Level 2/3 petroleum activity spill whereby DoT is the Control Agency, either within a single jurisdiction (State water only spills) or cross-jurisdictional (spills from Commonwealth to State waters), Santos will work in coordination with DoT in providing spill response capability. Santos' expanded organisational structure for these situations is detailed in Section 4.5.

5.2 Roles and responsibilities

The following tables provide an overview of the responsibilities of the:

- Santos CMT (Table 5-1)
- Santos IMT (Table 5-2)
- Field-based response team members (Table 5-3)
- DoT roles embedded within Santos CMT / IMT (Table 5-4)
- Santos roles embedded within the WA State MEECC / DoT IMT and FOBs (Table 5-5)

Not all of the roles listed are shown in Figure 5-1, as some of the roles in Table 5-2 are support roles or are specific to a particular response strategy. Full responsibilities and checklists/job cards of each role are described in the Incident Management Plan – Upstream Offshore (SO-00-ZF-00025), Santos Incident Management Handbook and Santos Crisis Management Plan (SMS-HSS-OS05-PD03) to support the incident action planning process. The IMT and field-based teams are scalable to the nature and scale of the response i.e. one person can take on multiple roles or one role can be filled by multiple people, where circumstances permit.

As per DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements, where DoT is the Control Agency for spill response Santos will provide personnel to work within DoT's organisational structure. DoT will also provide a Liaison Officer / Duty Incident Commander to the Santos IMT in a coordinated response.

Table 5-1: Roles and responsibilities in the Santos Crisis Management Team

Santos CMT Role	Main Responsibilities
Crisis Management Chair (CEO)	The CM Chair (Santos Chief Executive Officer) is responsible for the following: • Leads crisis management direction. • Provides governance and oversight of CMT operations. • Provides enterprise and strategic direction to the CMT for the resolution of the crisis event. • Delegates the CM Lead role and accountability to the appropriate ExCom designee. • Engage with the CM Lead to endorse the crisis resolution plan. • Liaise with the Santos Board and strategic stakeholders. • Provide the full extent of the company's resources to bring about a resolution and recovery from the crisis impact.
CMT Lead/ Duty Manager	The CMT Lead is responsible for: • Determine the need for establishing a Level 3 response and for activating the CMT. • Determine which / if any Crisis Management Support Teams (CMST) are mobilised. • Leading the crisis resolution process. • Ensures internal and external notifications to key stakeholders. • Uses the crisis resolution process to determine enterprise level impacts (potential or actual) and strategic objectives. • Ensures a crisis resolution plan is developed and direct the CMT functions to implement strategies, action plans and tasks. • Determines when it is appropriate to conclude the crisis response and stand down all or a portion of the CMT.
CMT Information Management	The CMT Information Managers directly support the CMT as follows: • Support the CMT during crisis management operations. • Sets up the crisis management room, assist with set-up of communications, video conferences and information transfer within the CMT. • Advises on CMT operating processes and available resources. • Assisting with reserving break out rooms for the CMT functions and CMSTs. • Ensuring CMT crisis resolution forms are used and displayed on the monitors. • Provides incident action plan information when an IMT is established. • Monitoring and managing the welfare needs of the CMT.
Crisis Management Advisor	The Crisis Management Advisor is responsible for the following: • Provides CMT process guidance and advice to CMT Lead, Function Leaders, and CMST.

Santos CMT Role	Main Responsibilities
	• Supports and facilitates the crisis resolution planning process. • Acts as the liaison between the CMT and IMT. • Work with CMT Information Managers to manage roster and handovers for extended CMT operations. • Schedules and facilitates post crisis debriefs and after-action reviews.: The Crisis Management Advisor will support the CMT Lead as follows: • Facilitates CMT activation requirements with the CMT Lead. • Assists the CMT Lead in maintaining an ongoing assessment of incident potential and analysis of stakeholder impacts. • Advises the CMT Lead on CMT structure and requirements for CMST engagement. • Coordinates tasks delegated by CMT Lead. • Provide tools to the CMT Lead for review and crisis assessment meetings.
CMT Function Leads	CMT Function Leads include Leaders for the following areas: • Legal Counsel and Risk • Environment Health Safety and Security • Operating Unit VP • People • Government and Public Affairs (GAPA) • Media and Communications The CMT Function Leads are responsible for the following: • Participate and contribute to the crisis resolution planning process. • Each Function Leader shall determine critical communications pertaining to their area. • Mobilise and coordinate activities of the function CMST. • Advise the CMT Lead on strategic impacts, threats and mitigation created by the crisis event. • Develop and execute strategies to meet objectives endorsed by the CM Chair. • Provide support and resources via the CMST to divisional IMTs. • Ensures critical actions, decisions or points of strategic criticality are included in the CMT log. • Participates in the crisis management debrief and after-action reviews.

Table 5-2: Roles and responsibilities in the Santos Incident Management Team

Santos Management/ IMT Role	Main Responsibilities
Vice President Offshore (VPO) Upstream WA	• Depending on the level of the incident, the VPO (and/or their delegate) will act as the primary liaison to the CMT Duty Manager. • On the activation of the IMT, the VP is advised by the IMT Duty Manager.
Incident Commander / Deputy Incident Commander	• Incident Commander is responsible for the overall management of the incident. Will set response objectives and strategic directions and oversee the development and implementation of Incident Action Plans
Safety Officer	• Safety Officer is responsible to develop and recommend measures for assuring personnel safety and to assess and/or anticipate hazardous and unsafe situations. Safety Officer may have specialists as necessary.
Public Information Officer	• Public Information Officer is responsible for developing and releasing information about the incident to media, incident personnel and to appropriate agencies and organisations
Human Resources Officer	• Human Resource (HR) Officer is responsible for advising and assisting the Incident Commander, Command Staff and Section Chiefs on any HR related aspects of an incident.
Operations Section Chief*	• The Operation Section Chief leads the Operations Section within the IMT and is responsible for the management of all tactical operations directly applicable to the primary assignments. The Operations Section Chief activates and supervises operational elements in accordance with the IAP and directs its execution.

Santos Management/ IMT Role	Main Responsibilities
Division Commander[4]	• Command an FOB for the coordination of resources mobilised to site. • Coordinate the field response as outlined in the Ningaloo Vision Oil Spill First Strike Plan and/or Incident Action Plans for each operational period developed by the IMT. • Establish and maintain effective operation of the Forward Operating Base (FOB), Divisional Staging Area (DSA) and any secondary staging areas. • Provide advice and input into the formulation of the incident action plan for the next operational period.
Source Control Branch Director	• The Source Control Branch Director will be responsible for the implementation of the Source Control Plan (Source Control Planning and Response Guideline – DR-00-OZ-20001). The Source Control Branch Director will activate and supervise source control elements in accordance with the Incident Action Plan and direct its execution.
Relief Well Team Leader	• The Relief Well Team Leader is responsible for the management and coordination of relief well design and operations. The Relief Well Team Leader coordinates the development of the drilling plans and procedures, secures resources and manages relief well operations to ensure the relief well reaches its target • Create groups as required to acquire relief well MODU, equipment and services and perform detailed relief well planning.
Well Intervention Team Leader	• The Well Intervention Team Leader is responsible for well intervention activities including initial site survey and debris clearance.
Monitoring Branch Director	• Working closely with the Environmental Unit, the Monitoring Branch Director will be responsible for implementing the operational and scientific monitoring plans required based on the nature and scale of the incident.
Staging Branch Director	• The Staging Branch Director is responsible for supervising the Staging Area Managers as well as coordinating their activities including assigning Staging Area Managers, receiving, maintaining, checking in/out, storing and distributing resources.
Air Operations Branch Director	• The Air Operations Branch Director is ground-based and is primarily responsible for the coordination of the air operations section (ICS 220) of the IAP and for providing logistical support to incident aircraft.
Offshore Response Branch	• Leads the offshore response activities. Depending on the size and nature of the incident, various groups, teams and task forces will be implemented, including Mechanical Dispersion group, Recovery and Protection group, and Dispersant Operations group. • The Mechanical Dispersion group is responsible for executing mechanical dispersion operations in the designated locations in compliance with the IAP. • The Recovery & Protection group is responsible for the deployment of containment and diversion/protection booming and managing on water recovery operations in the designated locations in compliance with the IAP. • The Dispersant Operations Group is responsible for coordinating all aspects of dispersant operations in compliance with the IAP. For aerial applications, the Group works closely with the Air Operations Branch.
Shoreline Clean-up Branch Director	• The Shoreline Clean-up Branch Director is responsible for leading all shoreline response activities working closely with the Shoreline Response Program Manager and shoreline clean-up supervisors and various locations.
Oiled Wildlife Response Branch Director	• Working with relevant state authorities, the Wildlife Response Branch Director will be responsible for implementing the OWR plan for the incident including the deployment of equipment and personnel required.
Waste Branch Director	• The Waste Branch Director is responsible for coordinating the on-site activities of personnel engaged in collecting, storing, transporting and disposing of waste materials, in compliance with the IAP.
Planning Section Chief*	• Planning Section Chief will lead the Planning Section within the IMT and is responsible for the collection, evaluation, dissemination and use of incident information and maintaining status of assigned resources.
Environment Unit Leader	• The Environment Unit Leader is responsible for environmental matters associated with the response, including strategic assessment, modelling, surveillance and environmental monitoring and permitting.

[4] *This role is only appointed when an FOB in Exmouth assumes control of in-field response operations.*

Santos Management/ IMT Role	Main Responsibilities
Situation Unit Leader	• The Situation Unit Leader is responsible for collecting, processing, and organizing incident information relating to escalation, mitigation or intelligence activities taking place in an incident. The Situation Unit will be responsible for preparing future projections of incident growth, maps, and intelligence information.
Resources Unit Leader	• The Resource Unit Leader is responsible for maintaining the status of all assigned tactical resources and personnel at an incident. The Resource Unit will oversee the check-in of all tactical resources and personnel, maintaining a status-keeping system indicating current location and status of all the resources.
Documentation Unit Leader	• The Documentation Unit Leader us responsible for maintenance of accurate, up-to-date incident files including Incident Action Plans. Incident reports, communication logs, situation status reports etc.
Shoreline Response Programme (SRP) Manager	• The SRP Manager reports to the Environment Unit Leader and is responsible for managing shoreline response • Provides input to Planning and Operations Section Chiefs on shoreline response program to minimise shoreline impacts and Shoreline Clean-up Assessment Team (SCAT) program.
SCAT Programme Coordinator	• SCAT Program Coordinator is the primary point of contact, through SRP Manager, within the IMT for all SCAT activities • SCAT Program Coordinator act as the project manager for SCAT program and will design and direct the SCAT program for any incidents • SCAT Program Coordinator will implement and manage the day-today activities for the SCAT program including establishing good management practices and safety protocols for the field teams, chairing SCAT Field Survey Team briefings and debriefings and producing daily and weekly summaries of field reports.
SCAT Field Coordinator	• SCAT Field Coordinator works with SCAT Program Coordinator to develop daily missions and rolling strategy for the field teams and to provide the necessary logistics and equipment support as required.
SCAT Data Manager	• SCAT Data Manager reports to the SCAT Program Coordinator and is responsible for processing field data, quality assurance, data storage and dissemination within the IMT, and for providing the SCAT Field Survey Teams with the maps and data required to conduct their missions.
Shoreline Treatment Recommendations (STR) Manager	• The STR Manager is responsible for the preparation of the Shoreline Treatment Recommendations (STRs) • STR Manager will work with the Environment Unit to obtain reconnaissance information to assess priority areas for initial SCAT surveys and gain approval for land access where appropriate • STR Manager ensures all approvals are obtained (e.g. concerning any endangered species, cultural, historical resources etc.) prior to undertaking shoreline activities • STR Manager will work with the Environment Unit's Technical Specialists, subject matter experts and stakeholders to ensure that their requirements and constraints are incorporated into shoreline treatment recommendations • STR Manager will work with the Operations Section to obtain advice on the feasibility, practicality and effectiveness of potential treatment strategies and tactics • STR Manager will track the progress of approved STRs to generate and update progress reports.
Logistics Section Chief*	• Logistics Section Chief is responsible for providing facilities, services and materials in support of the incident. The Logistics Section Chief participates in the development and implementation of the Logistics Section of the IAP.
Services Branch Director	• Service Branch Director, when activated is under the supervision of the Logistics Section Chief and is responsible for the management of all service activities for the incident including the operations of the Communications, Medical and Food Units
Support Branch Director	• Support Branch Director, when activated, is under the supervision of Logistics Section Chief and is responsible for the development and implementation of logistics plan in support of the IAP. The Support Branch supervises the operations of the Supply, Facilities, Ground Support and Vessel Support Units.
Finance Section Chief*	• Finance Section Chief is responsible for all the financial, administrative and cost analysis aspects of the incident and for supervising members of the Finance Section

Santos Management/ IMT Role	Main Responsibilities
Procurement Unit Leader	• Procurement Unit Leader us responsible for administering all financial matters pertaining to vendor contracts and leases. The Procurement Unit Leader will execute all procurements in accordance with the policies and procedures of Santos
Claims Unit Leader	• The Claims Unit Leader is responsible for the management and direction of all administrative matters pertaining to compensation and claims related matters for any incident
Cost Unit Leader	• The Cost Unit Leader is responsible for collecting all cost data and providing cost estimated and any cost saving recommendations for the incident

** Note: The Section Chiefs are supported by various other roles that will be mobilised depending on the severity of the incident.*

Table 5-3: Roles and responsibilities in the field-based response team

Field-based position	Main responsibilities
Emergency Commander[5]	• Assesses facility-based oil spill situations / incidents and respond accordingly. • Single point of communications between facility/site and IMT. • Directs emergency response activities in accordance with the Santos emergency response principles and philosophy. • Develops an IR strategy. • Communicates the IR actions and delegates actions to the Incident Commander in the IMT. • Manages the spill incident in accordance with the Facility Emergency Response Plan and/or the activity-specific OPEP (this document). • Coordinates medical evacuations as required. • Liaises with the Perth IMT Operations Section Chief if/when the IMT is established. *Refer to the Facility Emergency Response Plan (ERP) for detailed descriptions of roles and responsibilities.*
Emergency Coordinator	• Establishes and maintains contact with the incident scene. • Ensures information is passed to and from the On-Scene Commander, including relevant emergency information from the Command team time-outs. Such information may include the source of the spill, whether the spill is ongoing or contained, and no. of personnel responding. Also advise On-Scene Commander when next Command Team time-out will be. • Ensure accurate transfer of information from On-Scene Commander to Status Board log person. • Communicate with outside assistance, e.g. vessels, aircraft, etc. • If instructed, coordinate activities such as spill control/response strategies. • If instructed, liaise with onshore technical authorities & onshore IMT. • Inform Emergency Commander of incident and vessel status. *Refer to the facility ERP for further description descriptions of roles and responsibilities.*
On-Scene Commander (ERT Field Team Leader)	• Undertakes command and leads field response as directed by the Emergency Commander and/or Incident Commander (Perth based IMT) / Division Commander (if relevant), where safe to do so. • Establishes, when appropriate, a Forward Control Point. • Maintains spill responder safety in accordance with the Santos response philosophy. • Assures all field and affected area personnel are accounted for. • Considers tactical response in accordance with incident management guides. • Deploy and execute spill control/response strategy resources to contain and control the spill incident, as per advice from the Emergency Coordinator / Incident Commander / Division Commander. *Refer to the Facility ERP for further description of roles and responsibilities.*
Medical Evacuation Team	• Manage all medical and transportation requirements related to injured personnel to an appropriate medical facility.

[5] *This role is fulfilled by the Ningaloo Vision Offshore Installation Manager (OIM) or Vessel Master for vessel-based incidents.*

Field-based position	Main responsibilities
	• Refer to the Medical Evacuation Procedure (SO-91-IF-00020) for detailed descriptions of roles and responsibilities within the Medical Evacuation Team
Source Control Branch	• Respond to incidents involving well loss of containment to stop the flow of oil to sea. • Refer to the Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) for detailed descriptions of roles and responsibilities within the Source Control Branch.
Wildlife Response Branch	• Respond to oiled wildlife incidents to minimise the impacts to wildlife. • Refer to the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) for a description of the wildlife response branch, and the Santos Incident Management Handbook for detailed descriptions of roles and responsibilities within the Wildlife Response Branch.
Monitoring Branch	• Monitor the effectiveness of response strategies, and impacts and recovery to sensitive receptors from an oil spill and associated response actions. • Refer to the North West Shelf OSM-BIP (7715-650-ERP-0002) for detail on Scientific Monitoring Team roles and responsibilities.

Table 5-4: Department of Transport roles embedded within Santos' CMT/IMT

DoT roles embedded within Santos' CMT/IMT	Main responsibilities
DoT Liaison Officer (before DoT assuming role of Control Agency) **Deputy Incident Controller – State Waters** (after DoT assumes role of Control Agency)	• Provide a direct liaison between the Santos IMT and the State MEECC. • Facilitate effective communications between DoT's State Marine Pollution Coordinator (SMPC)/SMEEC/the Incident Controller and Santos' appointed CMT Lead/Incident Commander. • Provide enhanced situational awareness to DoT of the incident and the potential impact on State waters. • Assist in the provision of support from DoT to Santos. • Facilitate the provision of technical advice from DoT to Santos' Incident Commander as required.
Media Liaison Officer	• Provide a direct liaison between the Santos Media team and DoT IMT Media team. • Facilitate effective communications and coordination between the Santos and DoT media teams. • Assist in the release of joint media statements and conduct of joint media briefings. • Assist in the release of joint information and warnings through the DoT Information and Warnings team. • Offer advice to the Santos Media Coordinator on matters pertaining to DoT and wider Government media policies and procedures.

Table 5-5: Santos personnel roles embedded within the WA State Maritime Environmental Emergency Coordination Centre/Department of Transport Incident Management Team/ Forward Operations Base

Santos roles embedded within the State MEECC/ DoT IMT/ FOB	Main responsibilities
CMT Liaison Officer[6]	• Provide a direct liaison between the Santos CMT and the State MEECC. • Facilitate effective communications and coordination between the Santos CMT Lead and the SMPC. • Offer advice to SMPC on matters pertaining to Santos crisis management policies and procedures.
Deputy Incident Controller	• Provide a direct liaison between the DoT IMT and the Santos IMT. • Facilitate effective communications and coordination between the Santos Incident Commander and the DoT Incident Controller.

[6] *The role described as the Santos Offshore Liaison Officer in Figure 4-1.*

Santos roles embedded within the State MEECC/ DoT IMT/ FOB	Main responsibilities
	• Offer advice to the DoT Incident Controller on matters pertaining to the Santos incident response policies and procedures. • Offer advice to the Safety Coordinator on matters pertaining to Santos safety policies and procedures particularly as they relate to Santos employees or contractors operating under the control of the DoT IMT.
Deputy Intelligence Officer	• As part of the DoT Intelligence Team, assist the Intelligence Officer in the performance of their duties in relation to situation and awareness. • Facilitate the provision of relevant modelling and predications from the Santos IMT. • Assist in the interpretation of modelling and predictions originating from the Santos IMT. • Facilitate the provision of relevant situation and awareness information originating from the DoT IMT to the Santos IMT. • Facilitate the provision of relevant mapping from the Santos IMT. • Assist in the interpretation of mapping originating from the Santos IMT. • Facilitate the provision of relevant mapping originating from the Santos IMT.
Deputy Planning Officer	• As part of the DoT Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub-plans. • Facilitate the provision of relevant IAP and sub-plans from the Santos IMT. • Assist in the interpretation of the Santos OPEP from Santos. • Assist in the interpretation of the Santos IAP and sub-plans from the Santos IMT. • Facilitate the provision of relevant IAP and sub-plans originating from the DoT IMT to the Santos IMT. • Assist in the interpretation of Santos' existing resource plans. • Facilitate the provision of relevant components of the resource sub-plan originating from the DoT IMT to the Santos IMT. • (Note this individual must have intimate knowledge of the relevant Santos OPEP and planning processes).
Environment Support Officer	• As part of the Intelligence Team, assist the Environment Coordinator in the performance of their duties in relation to the provision of environmental support into the planning process. • Assist in the interpretation of the Santos OPEP and relevant Tactical Response Plan (TRPs). • Facilitate in requesting, obtaining and interpreting environmental monitoring data originating from the Santos IMT. • Facilitate the provision of relevant environmental information and advice originating from the DoT IMT to the Santos IMT.
Deputy Public Information Officer[7]	• As part of the Public Information Team, provide a direct liaison between the Santos Media team and DoT IMT Media team. • Facilitate effective communications and coordination between Santos and DoT media teams[8]. • Assist in the release of joint media statements and conduct of joint media briefings. • Assist in the release of joint information and warnings through the DoT Information & Warnings team. • Offer advice to the DoT Media Coordinator on matters pertaining to Santos media policies and procedures. • Facilitate effective communications and coordination between Santos and DoT Community Liaison teams.

[7] *In the event of an incident, Santos can provide the DoT IMT with a list of agencies, organisations, representative bodies, and other stakeholders that were consulted in the development of the Environment Plan to assist DoT with the management and provision of public information.*

[8] *In the event DoT assumes the role of Control Agency in State Waters, Santos acknowledges that the DoT IMT will be the lead IMT for public information and warnings and community liaison. In such circumstances, Santos retains the right to manage its own media interests, but acknowledges the strong preference for DoT and Santos to issue joint media statements and conduct joint media conferences and the importance of close liaison between the respective Media Teams.*

Santos roles embedded within the State MEECC/ DoT IMT/ FOB	Main responsibilities
	• Assist in the conduct of joint community briefings and events. • Offer advice to the DoT Community Liaison Coordinator on matters pertaining to Santos community liaison policies and procedures. • Facilitate the effective transfer of relevant information obtained from the Contact Centre to the Santos IMT.
Deputy Logistics Officer	• As part of the Logistics Team, assist the Logistics Officer in the performance of their duties in relation to the provision of supplies to sustain the response effort. • Facilitate the acquisition of appropriate supplies through Santos' existing OSRL, AMOSC and private contract arrangements. • Collects Request Forms from DoT to action via the Santos IMT. • (Note this individual must have intimate knowledge of the relevant Santos logistics processes and contracts).
Deputy Waste Management Coordinator	• As part of the Operations Team, assist the Waste Management Coordinator in the performance of their duties in relation to the provision of the management and disposal of waste collected in State waters. • Facilitate the acquisition of appropriate services and supplies through Santos' existing private contract arrangements related to waste management • Collect Waste Collection Request Forms from DoT to action via the Santos IMT.
Deputy Finance Officer	• As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through Santos' existing OSRL, AMOSC and private contract arrangements. • Facilitate the communication of financial monitoring information to Santos to allow them to track the overall cost of the response. • Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DoT and to be charged back to Santos.
Deputy Operations Officer	• As part of the Operations Team, assist the Operations Officer in the performance of their duties in relation to the implementation and management of operational activities undertaken to resolve an incident. • Facilitate effective communications and coordination between the Santos Operations Section and the DoT Operations Section. • Offer advice to the DoT Operations Officer on matters pertaining to Santos incident response procedures and requirements. • Identify efficiencies and assist to resolve potential conflicts around resource allocation and simultaneous operations of Santos and DoT response efforts.
Deputy Division Commander (FOB)	• As part of the Field Operations Team, assist the Division Commander in the performance of their duties in relation to the oversight and coordination of field operational activities undertaken in line with the IMT Operations Section's direction. • Provide a direct liaison between Santos' Forward Operations Base/s (FOB/s) and the DoT FOB. • Facilitate effective communications and coordination between Santos FOB Operations Commander and the DoT Division Commander. • Offer advice to the DoT FOB Operations Commander on matters pertaining to Santos incident response policies and procedures. • Assist the Safety Coordinator deployed in the FOB in the performance of their duties, particularly as they relate to Santos employees or contractors. • Offer advice to the Senior Safety Officer deployed in the FOB on matters pertaining to Santos safety policies and procedures.

5.3 Cost recovery

As required under Section 571(2) of the *OPGGS Act 2006*, Santos has financial assurances in place to cover any costs, expenses and liabilities arising from carrying out its petroleum activities, including major oil spills. This includes costs incurred by relevant Control Agencies (e.g. DoT) and third-party spill response service providers.

5.4 Training and exercises

In order to refresh IMT roles and responsibilities and provide familiarisation with OPEP processes and arrangements, IMT workshops are conducted as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).

To familiarise the IMT with functions and processes, an OPEP Desktop and Activation Exercise is undertaken as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001). Exercise planning takes into consideration virtual/remote access requirements.

All workshops and exercises undertaken are recorded in the Santos EHS Toolbox, with the key recommendations recorded and tracked.

5.4.1 Incident management team training and exercises

Santos provides training to its personnel to fill all required positions within the IMT.

Competency is maintained through participation in regular response exercises and workshops. Exercise and training requirements for Santos' IMT members are summarised in Table 5-6.

Table 5-6: Training and exercise requirements for incident management team positions

IMT Role	Exercise	Training
Incident Commander	One Level 3 exercise annually or two Level 2 exercises annually[9]	• PMAOMIR418 Co-ordinate Incident Response • AMOSC – IMO3 equiv. Oil Spill Response Command and Control
Operations Section Chief / Source Control Branch Director		• PMAOMIR322 Manage Incident Response Information • AMOSC – IMO3 equiv. Oil Spill Response Command and Control
Planning Section Chief Logistics Section Chief Environment Unit Leader		• PMAOMIR322 Manage Incident Response Information • AMOSC – IMO2 equiv. Oil Spill Management
Safety Officer Supply Unit Leader Geographic Information System (GIS) Team Leader Data Manager[10] HR Officer Situation Unit Leader Documentation Unit Leader IMT Log & Situation		• PMAOMIR322 Manage Incident Response Information • AMOSC – Oil Spill Response Familiarisation Training
Relief Well Team Leader Well Intervention Team Leader		• Drilling Well Control accredited training through International Well Control Forum (IWCF) • Level 4 (Well Site Supervisor Training)

5.4.2 Oil spill responder training

Santos has an internal capability of trained oil spill responders who can be deployed in the field in a spill response and has access to external, trained spill responder resources (Table 5-7).

Table 5-7: Spill responder personnel resources

[9] *All IMT members are required to participate in at least one Level 3 exercise every two years*

[10] *Data Manager is an administrative support role, not an IMT role, but is included here for completeness*

Responder	Role	Training	Available Number
Santos AMOSC Core Group Responders	Santos personnel trained and competency assessed by AMOSC as the AMOSC Core Group. Deployed by IMT for spill response operations.	AMOSC Core Group Workshop (refresher training undertaken every two years). AMOSC – IMO1 equiv. Oil Spill Response Operations	16
Santos Facility Emergency Response Teams	Present at Devil Creek, Varanus Island and Ningaloo Vision facilities for first-strike response to incidents.	Internal Santos training and exercises as defined in each facility's Emergency Response Plan Emergency Commander to have AMOSC – Oil Spill Response Familiarisation Training.	One ER team per operational facility per shift
Santos Aerial Observers	Undertake aerial surveillance of spill. Deployed by IMT in the aerial surveillance aircrafts.	AMOSC – Aerial Surveillance Course (refresher training undertaken triennially).	7
Santos Oil Spill Response Team	Provides a pool of Santos employees trained to perform leadership roles in an IMT or in the field during an oil spill response.	As per the Santos OSR training matrix	140[11]
AMOSC Core Group Oil Spill Responders	Industry personnel as the AMOSC Core Group, available to Santos under the AMOSPlan. For providing incident management (IMT) and operations (field response) assistance.	AMOSC Core Group Workshop (refresher training undertaken every two years). AMOSC – IMO1 equiv. Oil Spill Response Operations and/or IMO2 equiv. Oil Spill Response Management	As defined in Core Group Member Reports[12] Target to maintain at least 140 members (Ref.: AMOSC Core Group Program and Policies V2.0)
OSRL Oil Spill Response Personnel	Oil Spill Response Ltd professionals, providing technical, incident management and operational advice and assistance available under Santos-OSRL contract.	As per OSRL training and competency matrix.	18 responders guaranteed 80 dedicated responders available, may be approved under best endeavours
TRG Response Personnel	Emergency response personnel provided by arrangement with Santos	As per TRG training and competency matrix	60
AMOSC Staff	Professionals, providing technical, incident management and operational advice and assistance available under Santos-AMOSC contract.	As per AMOSC training and competency matrix.	16[13]
Santos Source Control Personnel	Management and coordination of source control strategies including relief well drilling and subsea intervention	Internal Santos training and exercises. IWCF Level 4 certification	60[14]
Oiled Wildlife Response Roles	Refer to Section 16 and Appendix M.		

[11] Note: The number of members in this pool is not directly related to the number of people required in the IMT or field at any one time. Rather it is a resource pool able to be called upon to fill roles in the IMT and field. Santos has arrangements in place to meet any shortfalls during an incident response as detailed in Section 4.7.4.

[12] A total of 100 personnel in the Core Group as of July 2024 (AMOSC Member's website), plus 16 AMOSC staff members (AMOSPlan 2021)

[13] AMOSC has a permanent staff of 16 available on a 24/7 basis (AMOSPlan 2021), 12 of which are available for field response, and 4 for admin/management support roles.

[14] Made up of D&C staff that are members of the Santos OSR Team, and other D&C staff.

Responder	Role	Training	Available Number
OSM Services Provider	Refer to Section 17 and Santos North West Shelf OSM-BIP (7715-650-ERP-0002), Section 9.1		
Level 1 Oiled Wildlife Responders (Workforce Hire)	Provide oiled wildlife support activities under supervision.	No previous training required; on the job training provided.	Nominally over 1,000
Shoreline clean-up personnel (Workforce Hire)	Manual clean-up activities under supervision.		

In addition to the resources listed in Table 5-7, the following resources are available for spill response and may be activated by the relevant Control Agency:

- National Plan: National Response Team – Trained oil spill response specialists, including aerial observers, containment and recovery crews, and shoreline clean-up personnel, will be deployed under the direction of the relevant Control Agency in a response. The National Response Team is trained and managed in accordance with the National Response Team Policy, approved by the National Plan Strategic Coordination Committee (AMSA 2021b).
- WA SHP-MEE: State Response Team (SRT) – Oil pollution response team available to assist under the jurisdiction of the DoT in State waters. SRT members remain trained and accredited in line with the SHP-MEE requirements (WA DoT 2023a).

In the event of a spill, the trained spill responders listed in Table 5-7 would be required to undertake various roles in key spill response operations, including monitor and evaluate, shoreline protection, shoreline clean-up and oiled wildlife response.

In the event of a spill, Team Leader roles for protection and deflection and shoreline clean-up would be filled through Santos' AMOSC Core Group Responders and then industry Core Group Responders.

5.5 Response testing arrangements and audits

Santos has oil spill response testing arrangements in place in accordance with the Santos Offshore Oil Spill Response Readiness Guideline (SO-91-OI-20001) which provides a process for continual monitoring of OSRO capability. This also includes regular oil spill response equipment inventory checks from the various sources. Testing of key response provider arrangements may be done as part of larger exercises or as standalone tests where the capability and availability of resources through the response provider are assessed against the performance requirement.

5.5.1 Testing arrangements

Not all spill preparedness and response arrangements will be tested simultaneously. The frequency of testing will relate to the potential spill level, spill risk and complexity of response.

Santos employs a range of tests to ensure that the various response arrangements function as required. These tests include:

- Contract/Plan review
- Audit
- Notification/communication check
- Desktop Exercise
- Deployment exercise
- Level 2/3 IMT Exercise

The above tests and the testing schedule are detailed in full within the Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001); an excerpt of the testing arrangements plan is provided in Figure 5-2. Objectives are set for the various tests identified for each of the response arrangements. The effectiveness of response arrangements against these objectives are assessed using pre-identified Key Performance Indicators (KPIs).

Santos

#	Response arrangements and critical components	Type of test	Schedule	Objectives	KPIs
	Shoreline Deflection & Protection b) Access to trained responders	Review – Contract / Agreement	Annually	To confirm access to trained responders	Review to confirm access to trained responders through the following; • AMOSC Participant Member Contract • OSRL Associate Member Contract • Access to National Plan resources through AMSA
	Shoreline Deflection & Protection c) Access to shallow draft vessels	Review – List of shallow draft vessel providers	Annually	To confirm access to shallow draft vessels to support shoreline deflection & protection	Review to confirm access to shallow draft vessel providers
	Shoreline Deflection & Protection d) Santos' shoreline deflection and protection equipment	Deployment Exercise	Annually	To confirm response readiness for Santos' shoreline deflection and protection equipment	• Shoreline deflection and protection booms and recovery devices (disc/brush skimmers) deployed successfully as per operational instructions • Shoreline Equipment Maintenance schedules recorded in SAP
	Shoreline Deflection & Protection	Desktop Exercise	Annually	IMT to confirm shoreline protection priorities and develop IAP shoreline deflection and protection sub-plan To test activation procedure to access shoreline deflection and protection equipment and trained responders from external arrangements and service providers To confirm access to shoreline deflection and protection equipment and personnel from external arrangements and service providers	• Shoreline protection priorities established by IMT • IAP shoreline deflection and protection sub-plan developed by IMT • Emails confirming access to shoreline deflection and protection equipment and trained responders through external arrangements and service providers
7.	Shoreline Clean-up				
	Shoreline Clean up a) Access to shoreline clean up equipment	Review – Contract / Agreement	Annually	To confirm access to shoreline clean-up equipment	Review to confirm access to shoreline clean-up equipment through the following; • AMOSC Participant Member Contract • OSRL Associate Member Contract • Access to National Plan resources through AMSA

Santos Ltd | Santos Offshore Oil Spill Response Readiness Guideline 7710-650-GDE-0001

Figure 5-2: Excerpt of testing arrangements plan

Source: Taken from Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001)

All testing activities are documented, and all reports generated will be saved in Santos's EHS Toolbox system. Once completed, records of testing arrangements are entered into the Santos EHS Toolbox and any actions, recommendations or corrective actions identified are assigned a responsible party for completion and tracked to closure. The status of completion is tracked through the 'Action module' in the EHS Toolbox and communicated widely through monthly EHS KPI reporting.

Source control testing arrangements have been formulated with reference to industry guidelines including the Australian Energy Producers (AEP) (formerly Australian Petroleum Production & Exploration Association [APPEA]) Offshore Titleholders Source Control Guideline (June 2021) and the NOPSEMA Information Paper: Source Control Planning and Procedures IP1979 (June 2021).

Source control objectives and KPIs are developed in order to test the response arrangements specified in this OPEP and the Source Control Planning and Response Guideline (DR-00-OZ-20001). In addition to objectives and KPIs, test frequency and type of test are also detailed in the Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001).

For each source control exercise, a copy of the exercise materials is recorded in the EHS toolbox. Action items identified are tracked in EHS toolbox to completion. Lessons learnt are incorporated into Santos guidelines and procedures as part of a process of continual improvement.

5.5.2 Audits

Oil spill response audits will follow the Santos Assurance Management Standard (SMS-MS15.1) and are scheduled as per the Santos annual Assurance Schedule. Audits will help identify and address any deficiencies in systems and procedures. At the conclusion of the audit, any opportunities for improvement and corrective actions (non-conformances) will be formally noted and discussed, with corrective actions developed and accepted. In some cases, audits may conclude with potential amendments to the OPEP.

Multiple oil spill response organisations are engaged by Santos. These organisations are responsible for the audit and maintenance of their own capacity. The Santos Emergency Response Coordinator (Oil Spill) maintains

oversight of the audit and maintenance programs of its service providers through regular reporting requirements and any third-party assurance activities. These include:

- The deployment readiness and capability of AMOSC's oil spill response equipment and resources in Geelong, Fremantle, Exmouth and Broome are audited every two years under the direction of AMOSC's participating members. The intent is to provide assurances to Santos and associated members about AMOSC's ability to respond to an oil spill incident as per the methods and responsibilities defined in OPEPs and AMOSC's Service Level Statement.
- The deployment readiness and capability of OSRL's oil spill response equipment and personnel are audited every two years by the Oil Spill Response Coordinator. The intent of this audit is to provide assurances to Santos of OSRL's ability to respond to an oil spill incident as per the methods and responsibilities defined in Santos' OPEPs and OSRL's SLA.

6. Response strategy selection

6.1 Spill scenarios

This OPEP outlines strategies, actions and supporting arrangements applicable for all credible oil spill events associated with Ningaloo Vision CoPFAR activities. Two credible spill scenarios have been identified in the Ningaloo Vision CoPFAR EP (EP Section 7) to represent the worst-case spills from a response perspective, taking into account the following characteristics:

- It represents the hydrocarbon types that could be spilt during CoPFAR activities.
- It represents the maximum credible release volumes.
- It represents the greatest spatial extent from a response perspective based on surface oil and shoreline accumulation as these are the key factors contributing to response.
- Proximity to sensitive receptors, shorelines and State/Commonwealth boundaries etc.

The worst-case credible spill risks selected to inform this OPEP and taken forward for oil spill modelling are presented in Table 6-1. The worst-case well release scenario was identified as a well barrier failure as a result either an external impact (i.e. collision of anchor with the subsea XT) or as a result of internal failure modes; a full bore well release was not deemed a credible scenario. The Ningaloo Vision CoPFAR EP (EP Section 7) details the derivation of these maximum credible spills.

For a description of the characteristics and weathering behaviour associated with hydrocarbons that may unintentionally be released refer to Appendix A.

Table 6-1: Maximum credible spill scenarios for Ningaloo Vision CoPFAR activities

Worst-case credible spill scenario	Approx. depth of spill	Hydrocarbon type	Max. credible volume released (m^3)	Release duration
Subsea crude oil; spill from a loss of well control (LOWC)	362 m	Van Gogh Crude	1,255	100 days*
Surface diesel release involving the FPSO	0 m	MDO	1,519	1 hour

* A release duration of 100 days has been used to inform spill modelling, risk assessment and spill response planning to be consistent with previous revisions of the EP and OPEP, however a relief well drilling timeline of 91 days has been assessed as achievable (Section 9.2.1). Therefore the 100 days spill scenario of is considered a conservative representation of risk and response requirements.

6.2 Response planning thresholds

Environmental impact assessment thresholds are addressed in Section 7 of the EP. In addition to the environmental impact assessment thresholds, response thresholds have been developed for response planning to determine the conditions that response strategies would be effective. These thresholds are provided as a guide for response planning based on case studies that have demonstrated some response strategies require certain oil spill thicknesses and conditions to be effective.

For example, containment and recovery effectiveness drops significantly with reduced oil thickness (McKinney and Caplis, 2017; NOAA, 2013). McKinney and Caplis (2017) tested the effectiveness of various oil skimmers at different oil thicknesses. Their results showed that the oil recovery rate of skimmers dropped significantly when oil thickness was <50 g/m^2.

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50–100 g/m^2 on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. This includes Bonn Agreement Oil Appearance Codes (BAOAC) 1–3 (EMSA, 2010).

Response planning thresholds are provided in Table 6-2.

Table 6-2: Hydrocarbon thresholds for response planning

Floating Hydrocarbon concentration (g/m²)	Description
≥1	Used (in part) for operational and scientific monitoring planning, as described in the North West Shelf OSM-BIP (7715-650-ERP-0002), Section 2.1
≥50	Estimated minimum floating hydrocarbon threshold for containment and recovery and surface dispersant application
≥100	Estimated floating hydrocarbon threshold for effective containment and recovery and surface dispersant application Estimated minimum shoreline accumulation threshold for shoreline clean-up

6.3 Spill modelling results

6.3.1 Stochastic modelling results

Two selected worst-case spill scenarios (subsea crude oil spill from a loss of well control (LOWC, RPS, 2024), and surface diesel release arising from a vessel collision involving the FPSO (GHD, 2020) were modelled for Ningaloo Vision CoPFAR activities using a stochastic approach.

RPS (2024) modelled the subsea crude oil spill from a loss of well control (LOWC). One hundred spill simulations were modelled for each season (i.e. 100 per season, 300 in total) using a number of unique environmental conditions sampled from historical metocean data. The simulations for the Van Gogh Crude spill were tracked for a period of 107 days.

GHD (2020) modelled the surface diesel release arising from the FPSO. One hundred and fifty spill simulations were modelled covering a range of environmental conditions. This simulation for the MDO spill was tracked for a period of 28 days.

For the purpose of spill response preparedness, outputs relating to floating oil and oil accumulated on the shoreline are most relevant (i.e. oil that can be diverted, contained, collected or dispersed through the use of spill response strategies) for the allocation and mobilisation of spill response resources. Therefore, these are the results presented in this OPEP for primary consideration.

The receptors predicted to receive floating oil or shoreline loading above the response planning thresholds for the LOWC scenario, and vessel collision involving the FPSO scenario are presented in Table 6-3 and Table 6-4 respectively. For each scenario the shoreline loading results represent the worst simulation results from all stochastic modelling runs across all seasons.

6.3.1.1 Subsea release of LOWC scenario

The stochastic modelling predicts that floating oil contact ≥1 g/m² could extend up to 170 km from the release location. No floating exposure ≥10 g/m² or ≥50 g/m² thresholds was predicted. The greatest probability of floating exposure for concentrations ≥ 1 g/m² is predicted at Ningaloo Outer NW (3%) and the minimum time before exposure was 3 days, 18 hours following the spill commencement for the subsea LOWC scenario (Table 6-3). No shoreline accumulation above the response threshold (≥100 g/m²) was predicted for this scenario.

The predicted probability of floating hydrocarbons ≥1 g/m² impacting State waters was 1.33% with a minimum time to contact of 20 days and 16 hours.

6.3.1.2 Surface release of MDO scenario

For the surface MDO scenario involving the FPSO, floating oil at a concentration ≥1 g/m² was predicted to extend up to approximately 280 km from the release location. At the moderate threshold (≥10 g/m²), the distance reduces to 220 km and 200 km as the threshold increases to ≥50 g/m².

The receptors predicted to be contacted by the floating oil above the moderate threshold of ≥10 g/m² are Ningaloo Offshore (100% probability, submerged receptor), Ningaloo Outer NW (28.7% probability, submerged receptor), Ningaloo Outer Coast North (4% probability, submerged receptor), Ningaloo Coast North (2% probability, emergent receptor) and Muiron Islands (0.7% probability, emergent receptor).

Shoreline accumulation ≥10 g/m² was predicted to occur at Ningaloo Coast North (15.3% probability), the Muiron Islands (3.3% probability) and Ningaloo Coast South (0.7% probability). Shoreline accumulation ≥100 g/m² was predicted to occur at the Muiron Islands (1.3% probability) and Ningaloo Coast North (2.7% probability).

The GHD 2020 modelling did not model entrained hydrocarbons at the low threshold of 1,000 ppb. Instead, a threshold of 500 ppb was used for the total water accommodated fraction (i.e. entrained hydrocarbons). At a concentration of 500 ppb entrained oil was predicted to extend up to approximately 110 km from the release location, potentially contacting Ningaloo Offshore (43.3% probability), Ningaloo Outer NW (10% probability) and Ningaloo Outer Coast North (2% probability).

Dissolved hydrocarbons at the low threshold (10 ppb) were predicted to extend a maximum distance of around 250 km from the release location.

At a moderate threshold of 50 ppb, the spatial extent decreased to approximately 250 km and to approximately 100 km at or above the high threshold value of 400 ppb.

The greatest probability of exposure for concentrations exceeding 10 ppb was predicted at Ningaloo Offshore (100% probability) and Ningaloo Outer NW (51.3%) due to the proximity of these receptors to the release location.

The full modelling results for dissolved and entrained oil for the worst-case scenarios have not been included given there are limited response strategies that will reduce subsurface impacts. However, Santos will use these results in the assessment of locations requiring a baseline data review for scientific monitoring (Appendix N). Refer to Section 7.1 of the EP for dissolved and entrained thresholds and Sections 7.2 and 7.3 for potential impacts to receptors from the LOWC and vessel collision involving FPSO spill scenarios respectively.

Table 6-3: Summary of floating oil exposure and shoreline accumulation above response planning thresholds for a subsea release of Van Gogh Crude from a LOWC during the Ningaloo Vision CoPFAR activities (RPS, 2024)

Receptor contact	Probability (%) of floating oil at concentrations ≥1 g/m²	Min. time for floating oil at concentrations ≥1 g/m² (days, hours)	Probability (%) of floating oil at concentrations ≥10 g/m²	Probability (%) of shoreline accumulation at concentrations ≥10 g/m²	Min. time for shoreline accumulation at concentrations ≥10 g/m² (days, hours)	Probability (%) of shoreline accumulation at concentrations ≥100 g/m²	Min. time for shoreline accumulation at concentrations ≥100 g/m² (hours)	Maximum accumulated volume (m³) along this shoreline	Max length of shoreline accumulation ≥100 g/m²
Gascoyne AMP	1.00	18 days, 7 hours	NC	NC	NC	NC	NC	NC	NC
Ningaloo – Outer Coast North	0.67	54 days, 17 hours	NC	NC	NC	NC	NC	NC	NC
Ningaloo – Outer NW	3.00	3 days, 18 hours	NC	NC	NC	NC	NC	NC	NC
State Waters - WA	1.33	20 days, 16 hours	NC	NC	NC	NC	NC	NC	NC
Barrow Island	NC	NC	NC	5.00	16 days, 19 hours	NC	NC	15	NC
Dampier Archipelago	NC	NC	NC	0.33	36 days, 12 hours	NC	NC	2	NC
Lowendal Islands	NC	NC	NC	0.67	28 days, 8 hours	NC	NC	2	NC
Middle Islands	NC	NC	NC	0.33	105 days, 14 hours	NC	NC	2	NC
Montebello Islands	NC	NC	NC	1.33	24 days	NC	NC	10	NC
Muiron Islands	NC	NC	NC	2.33	19 days, 18 hours	NC	NC	6	NC
Ningaloo Coast North	1.33	20 days, 16 hours	NC	4.33	16 days	NC	NC	38	NC
Northern Islands Coast	NC	NC	NC	0.33	29 days, 8 hours	NC	NC	2	NC
Southern Islands Coast	NC	NC	NC	1.33	43 days, 6 hours	NC	NC	10	NC
Thevenard Islands	NC	NC	NC	0.67	85 days, 10 hours	NC	NC	2	NC

NC = No Contact

= submerged receptor

Table 6-4: Summary of floating oil exposure and shoreline accumulation above response planning thresholds for a surface release of MDO involving the FPSO during the Ningaloo Vision CoPFAR activities (GHD, 2020)

Receptor contact	Probability (%) of floating oil at concentrations ≥1 g/m²	Min. time for floating oil at concentrations ≥1 g/m² (days, hours)	Probability (%) of floating oil at concentrations ≥10 g/m²	Probability (%) of shoreline accumulation at concentrations ≥10 g/m²	Min. time for shoreline accumulation at concentrations ≥10 g/m² (days, hours)	Probability (%) of shoreline accumulation at concentrations ≥100 g/m²	Min. time for shoreline accumulation at concentrations ≥100 g/m² (hours)	Maximum accumulated volume (m³) along this shoreline (≥100 g/m²)	Max length of shoreline accumulation ≥100 g/m²
Muiron Islands	0.7	2 days, 7 hours	0.7	3.3	2 days, 4 hours	1.3	2 days, 7 hours	22.8	11.3
Ningaloo Coast North	2.0	1 day, 0 hours	2.0	15.3	2 days, 4 hours	2.7	2 days, 4 hours	209.1	19.8
Ningaloo Coast South	NC	NC	NC	0.7	5 days, 19 hours	NC	NC	NC	NC
Ningaloo – Outer Coast North	4.0	0 days, 14 hours	4.0	NC	NC	NC	NC	NC	NC
Ningaloo Outer NW	28.7	0 days, 4 hours	26.7	NC	NC	NC	NC	NC	NC
Ningaloo Offshore	100	0 days, 2hours	100	NC	NC	NC	NC	NC	NC

NC = No Contact

= submerged receptor

6.3.2 Deterministic modelling results

No deterministic modelling was undertaken for this OPEP, given the predicted low probability of shoreline accumulation at the moderate threshold of ≥100 g/m^2.

6.4 Evaluation of applicable response strategies

Based on the nature and scale of the credible spill scenarios outlined in Section 6.1 and spill modelling results (Section 6.3) the following spill response strategies have been assessed as potentially applicable for combatting an oil spill (Table 6-5).

Note: The information contained in Table 6-5 has been developed by Santos for preparedness purposes. Santos may not be the Control Agency or Lead IMT for implementing a spill response. For example, for Level 2/3 spills within or entering State waters, DoT will ultimately determine the strategies and controls implemented for most State water activities with Santos providing resources and planning assistance.

Table 6-5: Evaluation of applicable response strategies

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		MDO	Van Gogh Crude	
Source Control	Shipboard Oil Pollution Emergency Plan	✓ 1	N/A	• MARPOL requirement for applicable vessels. In the event a vessel hydrocarbon storage tank is ruptured, applicable strategies for reducing the volume of hydrocarbon releases will be contained within the vessel SOPEP. This may include securing fuel via transfer to another storage area onboard the vessel, transfer to another vessel, or through pumping in water to affected tank to create a water cushion (tank water bottom). Trimming the vessel may also be used to avoid further damage to intact tanks. These actions will aim to minimise the volume of fuel spilled.
	Spill kits	✓ 1	N/A	• Relevant for containing spills that may arise onboard a vessel.
	Secondary containment	✓ 1	N/A	• Relevant for spills that may arise due to stored hydrocarbons, and from spills arising from machinery and equipment onboard a vessel. Bunded areas will contain hydrocarbons reducing the potential for a spill escaping to marine waters. Where applicable open deck drainage will be closed to prevent hydrocarbon draining into the marine environment.
	Relief well drilling	N/A	✓ 1	• Relevant to LOWC. Relief well drilling is the primary method for killing a blow-out well. To be conducted as per the Source Control Planning and Response Guideline (DR-00-OZ-20001) and Well- specific Source Control Plan.
	Capping stack	N/A	✗	• The suspended/shut-in wells are fitted with Xmas Tree's with all valves closed and tested and no well interventions to form part of this activity. • Capping Stacks are typically deployed to latch onto a wellhead, Blowout Preventer (BOP) or Lower Marine Riser Package (LMRP), providing a temporary 'tree' to close in an uncontrolled flow. • As the suspended/shut in wells already have a Xmas Tree installed, the Capping Stack cannot be fitted.
	Subsea First Response Toolkit (SFRT)	✗	✗	• Debris clearance equipment using the SFRT not required as a capping stack or subsea dispersant injection would not be deployed for this scenario.
In Situ Burning	Controlled burning of oil spill	✗	✗	• LOWC is not expected to result in a suitable thickness on the surface of Van Gogh crude to allow for ignition and burning. In addition, in-situ burning is not normally considered as an acceptable response strategy due to the atmospheric emissions created.
Monitor and Evaluate Plan	Vessel surveillance	✓ 1	✓ 1	• Provides real-time information on spill trajectory and behaviour (e.g. weathering). • Informs implementation of other response strategies. • Vessel personnel may not be trained observers. • Vessel observers on leaking vessel may not have capacity to observe oil during emergency response procedure implementation. • Constrained to daylight. • Limited to visual range from the vessel.

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		MDO	Van Gogh Crude	
				• Limited capacity to evaluate possible interactions with sensitive receptors.
	Aerial surveillance	✓ 1	✓ 1	• Provides real-time information on spill trajectory and behaviour (e.g. weathering). • May identify environmental sensitivities impacted or at risk of impact (e.g. seabird aggregations, other users such as fishers). • Informs implementation of other response strategies.
	Tracking buoys	✓ 1	✓ 1	• Can be implemented rapidly. • Can provide indication of near-surface entrained/dissolved hydrocarbons (most other monitor and evaluate techniques rely on the hydrocarbon being on the surface or shoreline).
	Trajectory Modelling	✓ 1	✓ 1	• Can be implemented rapidly. • Predictive – provides estimate of where the oil may go, which can be used to prepare and implement other responses. • No additional field personnel required. • Not constrained by weather conditions. • Can predict floating, entrained, dissolved and stranded hydrocarbon fractions. • May not be 100% accurate. • Requires in-field calibration.
	Satellite Imagery	✓ 1	✓ 1	• Can work under large range of weather conditions (e.g. night-time, cloud cover, etc.). • Mobilisation restricted to image availability. • Requires processing. • May return false positives.
Mechanical Dispersion	Vessel prop-washing	✓ 2	✓ 2	• Safety is a key factor and slicks with potential for high volatile organic compound (VOC) emission are not suitable. • Mechanical dispersion may be applicable for the localised entrainment of surface oil but is not considered to have a significant effect on removing oil from the surface. • Mechanical dispersion will entrain surface oil into the top layer of the water column. The aim of mechanical dispersion is to reduce the concentration of oil floating at the surface which could potentially contact receptors at the sea surface (e.g. sea birds) or shoreline receptors (e.g. mangroves). Once dispersed in the water column the smaller droplet sizes enhance the biodegradation process. • Marine diesel is a light oil, and can be easily dispersed in the water column by running vessels through the plume and using the turbulence developed by the propellers to break up the slick. • Mechanical dispersion may be considered for targeted small breakaway patches of crude but may have limited effectiveness.

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		MDO	Van Gogh Crude	
				• The potential disadvantage of mechanical dispersion is that it could temporarily increase the concentration of entrained and dissolved oil in the vicinity of submerged shallow water receptors (e.g. corals, seagrass ad macroalgae). This is most likely in shallow water of a few metres deep. The suitability of mechanical dispersion as a response measure would consider the prevailing environmental conditions (it mimics the action of wave induced entrained so is most beneficial in calm conditions) and the type, proximity and depth (as applicable) of sensitivities in the area. • Mechanical dispersion will be considered for petroleum activity sourced spills at the discretion of the OSC/IMT or by the relevant Control Agency. It is unlikely that vessels would be specifically allocated for mechanical dispersion but support vessels in the field undertaking primary strategies may be used opportunistically.
Chemical Dispersion	Vessel Application	✗	✓ 2	Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50–100 g/m^2 on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. **MDO** • MDO contains low level of persistent hydrocarbons and has high natural spreading, dispersion and evaporation rates in the marine environment. Generally, about 4% of the MDO mass should evaporate within the first 12 hours, 32% should evaporate within the first 24 hours and an additional 54% should evaporate over several days. The remaining 10% will not evaporate, though will slowly decay over time. Dispersant use is not advised on light distillate fuels such as MDO as these oils will evaporate and naturally disperse quite rapidly under most conditions (IPIECA-IOGP 2016a). • Therefore, considering the rapid evaporation rates of MDO and the tendency to naturally disperse, the addition of chemical dispersants would have little to no net environmental benefit whilst potentially increasing localised toxicity in the water column. **Van Gogh Crude** • Van Gogh crude is a highly persistent hydrocarbon and has been tested for amenability to dispersants (Corexit 9500, Slickgone NS and Finasol OSR 52). Testing indicated the crude to be amenable to dispersants, particularly against fresh crude, although amenability declined rapidly once the hydrocarbon had weathered (>3 days). • Although stochastic results from oil spill modelling indicated there was no probability of floating oil ≥50 g/m^2 for the LOWC scenario, surface dispersant has been selected as a secondary strategy in case there are areas observed at suitable thickness in the event of a spill. • SSDI is known to potentially reduce VOC levels at the sea surface, making conditions safer for responders and source control personnel. However, due to the low flow rates from the subsea LOWC scenario (~8.5 litres per minute), the heavy nature of Van Gogh Crude, and selection of relief well as the primary source control option, VOCs are not expected to adversely affect responders and source control personnel. In addition, due to the low flow rates it is likely there will not be enough turbulent mixing energy for a successful dispersant injection at the source. Over-dosing of the dispersant is also likely to be an issue. • A potential drawback of SSDI as a response tactic is that it will result in smaller droplet sizes and entrainment of hydrocarbons into the water column, which may affect some oceanic and benthic organisms (e.g. fish, plankton).
	Aerial Application	✗	✓ 2	
	Subsea Dispersant Injection	✗	✗	

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		MDO	Van Gogh Crude	
				• Considering the low predicted surface exposure of floating hydrocarbons and no shoreline accumulation ≥100 g/m^2 for this scenario, there is no benefit to either the environment or response personnel from attempting SSDI.
Offshore Containment and Recovery	Use of offshore booms/ skimmers or other collection techniques deployed from vessel/s to contain and collect oil	✗	✓ 2	**MDO** • Containment and recovery is not suitable for MDO given its rapid weathering nature and strong tendency to entrain into the upper water column in the presence of moderate winds (i.e. >13 knots). MDO will evaporate and spread quickly to a thin film, making recovery via skimmers difficult and ineffective. **Van Gogh Crude** • Although stochastic results from oil spill modelling indicated there was no probability of floating oil ≥50 g/m^2 for the LOWC scenario with Van Gogh Crude, containment and recovery has been selected as a secondary strategy for the LOWC scenario in case there are areas observed at suitable thickness to recover in the event of a LOWC event, as deemed beneficial by the NEBA.
Protection and Deflection	Booming in nearshore waters and at shorelines	✓ 2	✓ 2	• Considered if monitor and evaluate activities show or predict contact with sensitive shorelines. • Shoreline protection and deflection activities can result in physical disturbance to intertidal and shoreline habitats. **MDO** • Modelling shows low probability of contact with shorelines. Shoreline protection and deflection activities can result in physical disturbance to intertidal and shoreline habitats. Given the high rates of natural dispersion and the high rate of biodegradation of MDO, it would be better to focus on priority areas for protection. This strategy is a secondary response strategy for MDO where it is safe and practical to implement and where it is shown through operational monitoring that priority protection areas are at risk of impact from MDO. **Van Gogh Crude** • Although modelling only predicts a low probability of shoreline contact at the low threshold (≥1 g/m^2) for Ningaloo Coast North, in certain conditions or situations, shoreline protection and deflection may be a suitable strategy to prevent shoreline contact and is therefore considered a secondary response strategy for Van Gogh Crude.
Shoreline clean-up	Activities include physical removal, surf washing, flushing, bioremediation, natural dispersion	✓ 2	✓ 2	• Intrusive activities such as physical removal of waste using manual labour or mechanical aids requires careful site-specific planning to reduce secondary impacts of habitat disturbance, erosion and spreading oil beyond shorelines. Secondary impacts can be minimised through the use of trained personnel to lead operations. Logistically, clean-up operations will require site access, decontamination, waste storage, personal protective equipment, catering and transport services to support personnel working on shorelines. • Flushing may be considered if the hydrocarbon enters high priority/slow recovery habitats such as mangroves. Natural dispersion will occur as the hydrocarbon is remobilised from rock shelves and hard substrates, while residual hydrocarbons will biodegrade. **MDO** • Modelling shows low probability of contact with shorelines. Shoreline clean-up activities can result in physical disturbance to shoreline habitats. Given the high rates of natural dispersion and biodegradation of MDO, it would

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		MDO	Van Gogh Crude	
				be better to focus on priority areas for protection. This strategy is a secondary response strategy for MDO where it is safe and practical to implement and where protection priority areas are at risk of impacts from MDO. **Van Gogh Crude** • Although modelling only predicts shoreline accumulation at the low threshold (≥10 g/m^2), in certain conditions or situations, shoreline clean-up may be a suitable strategy to reduce environmental impacts and is therefore considered a secondary response strategy for Van Gogh Crude.
Oiled wildlife response	Activities include hazing, pre-emptive capture, oiled wildlife capture, cleaning and rehabilitation	✓ 1	✓ 1	• Can be used to deter and protect wildlife from contact with oil. • Mainly applicable for marine and coastal fauna (e.g. birds) where oil is present at the sea surface or accumulated at coastlines. • Surveillance can be carried out as a part of monitor and evaluate activities or the fauna specific operational monitoring. • Wildlife may become desensitised to hazing method. • Hazing may impact upon animals (e.g. stress, disturb important behaviours such as nesting or foraging). • Permitting requirements for hazing and pre-emptive capture.
Operational and Scientific Monitoring	The monitoring of the effectiveness and potential impacts of response strategies; and the monitoring of environmental receptors to determine the level of impact from the oil spill and associated response activities that is sufficient to inform any remediation activities	✓ 1	✓ 1	Operational monitoring activities include: • hydrocarbon properties and weathering behaviour • water and sediment quality assessment • chemical dispersant effectiveness and fate assessment • rapid marine fauna surveillance • shoreline clean-up assessment Scientific monitoring activities include: • water and sediment quality assessment • intertidal and coastal habitat assessment • seabirds and shorebirds assessment • marine megafauna assessment • benthic habitat assessment • marine fish and elasmobranch assemblages assessment • fisheries assessment • heritage features assessment • social impact assessment

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		MDO	Van Gogh Crude	
				The type and extent of operational and scientific monitoring will depend upon the nature and scale of hydrocarbon contact to sensitive receptor locations. Pre-defined initiation criteria exist for operational and scientific monitoring plans.

6.5 Identification of priority protection areas and initial response priorities

Prioritising receptors helps identify where available resources (for response and/or monitoring) should be directed for the best effect. It enables the control agency to make informed decisions, and ultimately in the development and execution of an effective response strategy.

Combined spill modelling results were used to predict the Environment that May be Affected (EMBA) for the Ningaloo Vision CoPFAR activities (refer to Section 3.1 of the Ningaloo Vision CoPFAR EP [7750-650-EIS-0007]). The EMBA is the largest area within which effects from hydrocarbon spills associated with this activity, could extend. Within the EMBA, priority protection areas (PPAs) have been identified. Priority protection areas are emergent features (i.e. coastal areas and islands) that are predicted to be contacted above moderate exposure values at greater than 5% probability and would be targeted by nearshore spill response operations such as protection and deflection and shoreline clean-up. Sections 7.5.5.3 and 7.5.5.4 of the Ningaloo Vision CoPFAR EP (7750-650-EIS-0007) describes the basis for determining hot spots and PPAs. These are further described in EP Sections 7.6 and 7.7 for the MDO and LOWC spill scenarios respectively.

Table 6-6 shows the rationale for the hotspots that were selected as PPAs from the list of contacted receptors from the surface MDO and subsea LOWC release scenarios.

Table 6-6: Determination and rationale for the protection priority areas

Hotspots	Type	HEV Ranking	Hotspot	PPA	Rationale
Ningaloo Outer NW	Submerged	3	Y	N	MDO Only • Within EMBA for dissolved and surface hydrocarbons • Submerged receptor
Ningaloo Offshore	Submerged	2	Y	N	MDO Only • Within EMBA for dissolved and surface hydrocarbons • Submerged receptor
Ningaloo Outer Coast North	Submerged	1	Y	N	MDO Only • Low probability within EMBA for dissolved hydrocarbons only • Submerged receptor
Ningaloo Coast North	Emergent	1	Y	Y	MDO • Predicted accumulation of 209 m^3 and 19.8 km of shoreline oiled (at ≥100 g/m^2) • 2 days to contact and is the receptor with the largest volume onshore LOWC • Predicted accumulation volume of 38 m^3 and 25 km length of shoreline oiled (at ≥10 g/m^2). • 16 days to contact.
Muiron Islands	Emergent	2	Y	Y	MDO • Predicted accumulation of 23 m^3 and 11.3 km of shoreline oiled (at ≥100 g/m^2) • 2 days to contact. LOWC • Predicted accumulation volume of 6 m^3 and 4 km length of shoreline oiled (at ≥10 g/m^2). • 19 days and 18 hours to contact.
Barrow Island	Emergent	3	Y	Y	LOWC

Hotspots	Type	HEV Ranking	Hotspot	PPA	Rationale
					• Predicted accumulation volume of 15 m^3 and 10 km length of shoreline oiled (at ≥10 g/m^2). • 16 days and 19 hours to contact and is the second largest volume ashore.
Montebello Islands	Emergent	3	Y	N	LOWC • Predicted accumulation volume of 10 m^3 and 7 km length of shoreline oiled (at ≥10 g/m^2). • Not considered a protection priority –24 days to contact, allowing for sufficient response mobilisation time.

Table 6-7 lists the key sensitivities and associated locations within the PPAs identified for the worst-case spill scenarios for a LOWC (Van Gogh Crude) and surface release of MDO. The ranking of these sensitivities (also referred to as receptors) are listed, which is consistent with the rankings in the Provision of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 2: Pilbara (Advisian 2017). Using a combination of sensitivities, and their associated rankings; together with the modelled maximum total volumes ashore and minimum time to shoreline contact, an initial response priority is provided in Table 6-7. This information is designed to aid decision making in the preliminary stages of the response operation, so that initial resources are used for best effect.

Note, the PPAs for response also correspond with the wildlife priority protection areas presented in Section 16.2, with further detail on the species that may be present and key locations provided in Table 16-3.

Table 6-7: Initial response priorities for Ningaloo Vision CoPFAR activities

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[15]	DoT Ranking (Dissolved oil)	Key locations	Relevant key periods	Peak volume ashore (m^3)	Min. arrival time accumulated oil ashore ≥10 g/m^2 (hours)	Initial response priority
Barrow Island	Mangroves	3	3	Bandicoot Bay	N/A	15 (Van Gogh Crude)	16 days, 19 hours (Van Gogh Crude)	Medium
	Turtles Regionally and nationally significant green turtle (*Chelonia mydas*) , flatback turtle (*Natator depressus*), loggerhead turtle (*Caretta caretta*) and hawksbill turtle (*Eretmochelys imbricata*)	4	3	Western side of Barrow Island (green turtles) Eastern side of Barrow Island (flatback turtles) Turtle Bay north beach, north and west coasts and John Wayne Beach (loggerhead and hawksbill turtle nesting)	Nesting year round, peak Oct–Jan			High
	Birds Migratory birds (important habitat); 10th of top 147 bird sites, Highest population of migratory birds on Barrow Island Nature Reserve (south-south-east of the Island), Double Island has important bird nesting habitat (shearwaters [*Puffinus sp.*], sea eagles [*Haliaeetus sp.*])	2	1	Double Islands – migratory birds Bandicoot Bay and widespread on Barrow Island – migratory birds	Nesting: Sep–Feb			Low
	Coral and other subsea benthic primary producers	3	4	Eastern side – Biggada Reef	Coral spawning: Mar and Oct			Medium
	Socio-economic Significant for recreational fishing and charter boat tourism, Nominated place (National heritage), Industry – Reverse Osmosis Plant and port operations Petroleum Activities such as Barrow Island petroleum production	5	5	Reverse Osmosis plant and port on eastern side of island (Port of Barrow Island)	N/A			Medium

[15] *Provision of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 2: Pilbara (Advisian 2017).*

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[15]	DoT Ranking (Dissolved oil)	Key locations	Relevant key periods	Peak volume ashore (m^3)	Min. arrival time accumulated oil ashore ≥10 g/m^2 (hours)	Initial response priority
Muiron Islands	<u>Turtles</u> Turtle nesting – major loggerhead (*Caretta caretta*) site, significant green turtle (*Chelonia mydas*) nesting site, low density hawksbill nesting (*Eretmochelys imbricata*), occasional flatback (*Natator depressus*) presence	4	3	Loggerhead – South Island	Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan	6 (Van Gogh Crude) 23 (MDO)	19 days, 18 hours (Van Gogh Crude) 2 days, 7 hours (MDO)	High
	Coral and other subsea benthic primary producers	3	4	N/A	Coral spawning Mar & Oct			Medium
	Seabird nesting	2	1	Widespread	Nesting: Sep–Feb			Low
	Humpback whale migration	3	2	N/A	Peak between June –Aug			Medium
	Exmouth gulf prawn fishery (Muiron is western boundary); significant for recreational fishing and charter boat tourism	1	2		Prawn fishery – April to November			Low
Ningaloo Coast North	World Heritage Area	5	5	N/A	N/A	38 (Van Gogh Crude) 209 (MDO)	16 days (Van Gogh Crude) 2 days, 5 hours (MDO)	High
	Mangroves	3	3	Mangrove Bay Yardie Creek	N/A			High
	<u>Turtles</u> Loggerhead (*Caretta caretta*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata)* (low density)	4	3	North Mauds Landing, south of Point Cloates, Mandu Creek to Yardie Creek, Jurabi Point, Gnarraloo Bay and Cape Farquhar	Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan			High
	<u>Marine mammals</u> Pygmy blue whales (*Balaenoptera musculus brevicauda*) foraging area. Dugongs (*Dugong dugon*) Marine/migratory, breeding and foraging	3	2	N/A	Pygmy blue whale migration: Apr to Aug Humpback whale migration: Jun to Jul			Medium

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[15]	DoT Ranking (Dissolved oil)	Key locations	Relevant key periods	Peak volume ashore (m^3)	Min. arrival time accumulated oil ashore ≥10 g/m^2 (hours)	Initial response priority
	Sharks and rays Seasonal aggregations of whale sharks (*Rhincodon typus*) and manta rays	2	3	N/A	Whale sharks – Mar to Jul			Medium
	Birds 33 species seabirds and avifauna (Including Eastern Curlew; *Numenius madagascariensis*)	5	4	Main breeding areas at Mangrove Bay, Mangrove Point, Point Maud, the Mildura wreck site and Fraser Island	Nesting: Sep to Feb			High
	Coral and other subsea benthic primary producers	3	4	Largest fringing reef in Australia	Coral spawning: Mar & Oct			High
	Tourism – significant fishing/charter boat tourism, camping and use of nearshore sanctuary zones (fishing, snorkelling)	2	2	Numerous campsites and snorkelling sites along western Cape Range shorelines, Coral Bay, Waroora Station	Year-round			Medium

6.5.1 Tactical response plans for priority protection areas

Santos' Tactical Response Plans (TRPs) are in place for certain receptors (Table 6-8), identifying suitable response strategies, equipment requirements, relevant environmental information, and access and permit requirements. TRPs are to be used by the IMT for first strike and ongoing activities and to assist in informing the appropriate responses for inclusion in an IAP.

Not all PPA's require TRPs in place. The requirement for a TRP considers the hydrocarbon type and predicted time to contact to a PPA from accumulated or floating hydrocarbons in <10 days (above the response planning thresholds defined in Section 6.2). Ten days allows two days to get services procured; six days to draft the TRP; and two days to implement. The Sensitivity Ranking (HEV and DoT), and accessibility (i.e. on mainland compared to a remote island location) are also considered. A TRP will also be considered should the impact from hydrocarbons be considerable (high accumulation, large floating oil contact). Although the predicted contact times for the PPAs are >10 days, and are below response planning thresholds, existing TRPs have been included as detailed in Table 6-8.

Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, Pilbara Region Oiled Wildlife Response Plan and WAMOPRA. Additionally, TRPs for contacted receptors will be sought from other titleholders where possible.

Table 6-8: Tactical response plans for priority protection areas

PPA	TRP Evaluation	Existing TRP
Barrow Island	• NWS OPEP Volume 2: Environmental Resource Atlas (includes Barrow Island) • Chevron Australia TRPs for Barrow Island (Santos has an agreement with Chevron for use of the following TRPs): – Wapet Landing – Double Islands – Mushroom Beach – Terminal Beach – MOF Basin and Seawater Intakes – Bivalve Beach – Inga Beach – Yacht Club – Little Bandicoot Bay – Turtle Bay – Whites Beach	Yes
Muiron Islands	Existing TRP in place for Muiron Islands	Yes
Ningaloo Coast North	Existing TRPs in place for: – Wapet Landing – Jurabi to Lighthouse Bay beaches – Mangrove Bay – Muiron Islands – Turquoise Bay – Yardie Creek	Yes

6.6 Net environmental benefit analysis

The IMT uses a NEBA, also referred to as a spill impact mitigation assessment (SIMA), to inform the incident action planning process (Section 8), so the most effective response strategies with the least detrimental environmental impacts can be identified, documented and executed.

Within Santos's IMT, the Environment Unit Leader is responsible for reviewing the priority receptors identified within the EP and this OPEP and coordinating the Operational NEBA to identify and prioritise initial response priorities and apply the NEBA to identify which response strategies are preferred for the situation, oil type and behaviour, environmental conditions, direction of plume and priorities for protection.

As a component of the incident action planning process, a NEBA is conducted by the Control Agency with responsibility for the spill response activity. Where there are different activities controlled by different IMTs, as in a

cross-jurisdictional response between Santos and WA DoT, consultation will be required during the NEBA process such that there is consistency in the sensitivities prioritised for response across the Control Agencies.

A strategic NEBA has been developed for all response strategies identified as applicable to the spill scenarios, with the benefit or potential impact to each sensitivity identified (refer to Table 6-9 and Table 6-10).

In the event of a spill, a NEBA is applied with supporting information collected as part of the Monitor and Evaluate Plan (Section 10) to achieve the following:

- Identify sensitivities within the area potentially affected by a spill at that time of the year (noting that the sensitivity of some key receptors, such as birdlife and turtles, varies seasonally).
- Assist in prioritising and allocating resources to sensitivities with a higher protection and response priority (Table 6-7).
- Assist in determining appropriate response strategies with support of real-time metocean conditions, oil spill tracking and fate modelling.

When a spill occurs, a NEBA is applied to the current situation, or operationalised. Operational NEBA Templates are filed within the Environment Unit Leader folder on the Santos ER Intranet site. To complete the Operational NEBA:

- All ecological and socioeconomic sensitivities identified within the spill trajectory area are recorded.
- Potential effects of response strategies on each sensitivity are assessed in terms of their benefit or otherwise to the socio-economic sensitivities.
- All persons involved and data inputs have been considered for the analysis.

The Operational NEBA Form documents the decisions behind the recommendation to the Incident Commander on which resources at risk to prioritise, and the positives and negatives of response strategies to deploy. The Operational NEBA provides guidance to the IAPs and is revisited each Operational Period.

6.7 Oil spill response ALARP assessment

For each response strategy included within this OPEP an environmental performance outcome has been determined and key control measures and performance standards have been identified such that the response can meet the required performance outcome. For each response strategy, an ALARP assessment has been conducted to demonstrate that the control measures mitigate the risk of an oil spill to ALARP.

Appendix B details the ALARP assessment framework and the results of the ALARP assessment conducted to inform the control measures and performance standards contained within this OPEP.

Table 6-9: Strategic net environmental benefit analysis matrix for a LOWC (Van Gogh Crude) during the Ningaloo Vision CoPFAR campaign

Priority for Protection Area	No Controls	Source Control	Monitor and evaluate	Mechanical Dispersion	Surface Dispersant	Containment & Recovery	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	OSM
Barrow Island										
Turtle nesting – particularly flatback (western side) and green turtles (eastern side)										
Mangroves and mudflats (shorebird foraging) – Bandicoot Bay									N/A	
Coral and other subsea benthic primary producers – incl. Biggada Reef							N/A	N/A	N/A	
Seabird nesting – incl. Double Island										
Migratory shorebirds – particularly Bandicoot Bay										
Aboriginal listed sites incl. pearling camps										
Muiron Islands										
Turtle nesting – major loggerhead site, significant Green turtle nesting site										
Mangroves									N/A	
Coral and other subsea benthic primary producers							N/A	N/A	N/A	
Seabird nesting										
Humpback whale migration							N/A	N/A		

Priority for Protection Area	No Controls	Source Control	Monitor and evaluate	Mechanical Dispersion	Surface Dispersant	Containment & Recovery	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	OSM
Tourism – significant fishing/charter boat tourism										
Ningaloo Coast North										
World Heritage Area										
Mangroves (Mangrove Bay, Yardie Creek)									N/A	
Turtle nesting and breeding sites loggerhead, green and hawksbill turtles										
Pygmy blue whale foraging area. Dugongs breeding and foraging area										
Whale shark and manta ray aggregations										
Seabird nesting										
Coral and other subsea benthic primary producers							N/A	N/A	N/A	
Tourism – significant fishing/charter boat tourism, camping and use of nearshore sanctuary zones (fishing, snorkelling)										

	Beneficial impact
	Possible beneficial impact dependent upon the situation (e.g. Timeframes and metocean conditions to dilute entrained oil)
	Negative impact
N/A	Not applicable for the environmental value

Table 6-10: Strategic net environmental benefit analysis matrix for a vessel collision involving the FPSO (MDO) during the Ningaloo Vision CoPFAR campaign

Priority for Protection Area	No Controls	Source Control	Monitor and evaluate	Mechanical Dispersion	Surface Dispersant	Containment & Recovery	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	OSM
Muiron Islands										
Turtle nesting – major loggerhead site, significant Green turtle nesting site					N/A	N/A				
Mangroves					N/A	N/A		N/A	N/A	
Coral and other subsea benthic primary producers					N/A	N/A	N/A	N/A	N/A	
Seabird nesting					N/A	N/A				
Humpback whale migration					N/A	N/A	N/A	N/A		
Tourism – significant fishing/charter boat tourism					N/A	N/A				
Ningaloo Coast North										
World Heritage Area					N/A	N/A				
Mangroves (Mangrove Bay, Yardie Creek)					N/A	N/A			N/A	
Turtle nesting and breeding sites loggerhead, green and hawksbill turtles					N/A	N/A				
Pygmy blue whale foraging area. Dugongs breeding and foraging area					N/A	N/A	N/A	N/A		
Whale shark and manta ray aggregations					N/A	N/A	N/A	N/A		
Seabird nesting					N/A	N/A				

Priority for Protection Area	No Controls	Source Control	Monitor and evaluate	Mechanical Dispersion	Surface Dispersant	Containment & Recovery	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	OSM
Coral and other subsea benthic primary producers					N/A	N/A	N/A	N/A	N/A	
Tourism – significant fishing/charter boat tourism, camping and use of nearshore sanctuary zones (fishing, snorkelling)					N/A	N/A				
	Beneficial impact									
	Possible beneficial impact dependent upon the situation (e.g. Timeframes and metocean conditions to dilute entrained oil)									
	Negative impact									

6.8 Oil spill response as-low-as-reasonably-practicable assessment

For each response strategy included within this OPEP an environmental performance outcome has been determined and key control measures and performance standards have been identified such that the response can meet the required performance outcome. For each response strategy, an ALARP assessment has been conducted to demonstrate that the control measures mitigate the risk of an oil spill to ALARP.

Appendix B details the ALARP assessment framework and the results of the ALARP assessment conducted to inform the control measures and performance standards contained within this OPEP.

7. External notifications and reporting requirements

For oil spill incidents, the OSC (or Company Site Representative) will notify the Perth-based IMT for delegation of further notifications to relevant regulatory authorities and for further spill response assistance for Level 2/3 spills.

7.1 Regulatory notification and reporting

The Incident Commander (IC) is to delegate the following regulatory reporting requirements. Typical delegated parties will be the Planning Section Chief.

Contact details for the Regulatory agencies outlined in Table 7-1 are provided within the Incident Response Telephone Directory (SO-00-ZF-00025.020).

Table 7-1 outlines the external regulatory reporting requirements specifically for oil spill incidents in Commonwealth and State jurisdictions, noting that regulatory reporting may apply to smaller Level 1 spills that can be responded to using on-site resources as well as larger Level 2/3 spills. There are also additional requirements for Vessel Masters to report oil spills from their vessels under relevant marine oil pollution legislation (e.g. MARPOL). This includes, where relevant, reporting oil spills to AMSA RCC and WA DoT (MEER unit).

State water notifications to WA DoT will apply to spills in State waters or spills originating in Commonwealth waters and moving to State waters.

7.2 Activation of external oil spill response organisations and support agencies

Table 7-2 outlines notifications that should be made to supporting agencies to assist with spill response activities outlined within this plan. This list contains key OSROs that have pre-established roles in assisting Santos in an oil spill response. It is not an exhaustive list of all providers that Santos may use for assisting an oil spill response.

The Incident Response Telephone Directory (SO-00-ZF-00025.020) contains a more detailed list and contact information for incident response support and is updated every six months with up-to-date revisions available within the IMT room and online (intranet procedures and emergency response pages).

7.3 Environmental performance

Table 7-3 lists the environmental performance standards (EPS) and measurement criteria for external notifications and reporting.

Table 7-1: External notification and reporting requirements (International, Commonwealth and State waters)

Agency / Authority	Type of Notification / Timing	Legislation / Guidance	Reporting Requirements	Responsible Person / Group	Forms
NOPSEMA reporting requirements for Commonwealth water spills					
NOPSEMA (Incident Notification Office) NOPSEMA	Verbal notification within two hours Written report as soon as practicable, but no later than three days	*Petroleum and Greenhouse Gas Storage* Act 2006 Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations 2024	A spill associated with the activity in Commonwealth waters that has the potential to cause moderate to significant environmental damage1	Notification by Planning Section Chief (or delegate)	Incident reporting requirements: https://www.nopsema.gov.au/environmental-management/notification-and-reporting/
National Offshore Petroleum Titles Administrator (NOPTA) (Titles Administrator)	Written report to NOPTA within seven days of the initial report being submitted to NOPSEMA	Guidance Note (N-03000-GN0926) Notification and Reporting of Environmental Incidents	Spill in Commonwealth waters that is reportable to NOPSEMA	Notification by Planning Section Chief (or delegate)	Provide same written report as provided to NOPSEMA
AMSA Rescue Coordination Centre (RCC)[2]	Verbal notification within two hours of incident Written POLREP form, within 24 hours on request from AMSA	MARPOL 73/78	Santos to notify AMSA of any marine pollution incident[1]	Notification by Planning Section Chief (or delegate)	AMSA POLREP: https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (Director of monitoring and audit section)	Email notification as soon as practicable	*Environment Protection and Biodiversity Conservation Act 1999*	If Matters of National Environmental Significance (MNES) are considered at risk from a spill or response strategy, or where there is death or injury to a protected species	Notification by Planning Section Chief (or delegate)	Not applicable
Parks Australia (24-hour Marine Compliance Duty Officer)	Verbal notification as soon as practicable	*Environment Protection and Biodiversity Conservation Act 1999*	An oil spill which occurs within a marine park or are likely to impact on	Notification by Planning Section Chief (or delegate)	Not applicable, but the following information should be provided: • Titleholder's details

Agency / Authority	Type of Notification / Timing	Legislation / Guidance	Reporting Requirements	Responsible Person / Group	Forms
			an Australian Marine Park		• Time and location of the incident (including name of marine park likely to be affected) • Proposed response arrangements as per the OPEP • Confirmation of providing access to relevant monitoring and evaluation reports when available • Details of the relevant contact person in the IMT
Australian Fisheries Management Authority (AFMA)	Verbal phone call notification within 24 hours of incident	For consistency with DPIRD Fisheries notification	Reporting of marine oil pollution1 Fisheries within the environment that may be affected (EMBA) Consider a courtesy call if not in exposure zone	Notification by Planning Section Chief (or delegate)	Not Applicable
If a spill heading towards WA State Waters					
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) (Petroleum Environment Duty Officer)	Verbal phone call within two hours of incident being identified Follow up written notification within three days	Regulations 28, 29 and 30 of the Petroleum (Submerged Lands) (Environment) Regulations 2012 Guidance Note on Environmental Non-compliance and Incident Reporting	All actual or impending spills in State waters	Notification by Planning Section Chief (or delegate)	Environmental and Reportable Incident/ Non-compliance Reporting Form http://www.dmp.wa.gov.au/Documents/Environment/ENV-PEB-189.docx
WA Department of Transport (WA DoT)[2] (MEER Duty Officer)	Verbal notification within two hours Follow up with Pollution Report (Appendix C) as soon as practicable after verbal notification	*Emergency Management Act 2005* State Hazard Plan: Maritime Environmental Emergencies	Santos to notify of actual or impending Marine Pollution Incidents (MOP) that are in, or may impact, State waters	Notification by Planning Section Chief (or delegate) MEER Duty Officer contacted per Incident	WA DoT POLREP (Appendix C): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf WA DoT SITREP (Appendix D): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf

Agency / Authority	Type of Notification / Timing	Legislation / Guidance	Reporting Requirements	Responsible Person / Group	Forms
	If requested, submit Situation Report (Appendix D) within 24 hours of request	Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements	Emergency Management Regulations 2006 define MOP as an actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life, injury to a person or damage to the health of a person, property or the environment[1]	Telephone Directory	
Port of Varanus Island (VI) (Pilbara Ports Authority) *If spill is heading towards Port of VI Limits (Lowendal Islands)*	Verbal notification within 4 hours to Harbour Master via VI Port Control. Follow up report within 48 hours through the Pilbara Port Authority Hazard and Incident Reporting Form: https://www.pilbaraports.com.au/safety-and-security/hazard-and-incident-reporting Follow up with POLREP as soon as practicable after verbal notification	*Port Authorities Act 1999* Pilbara Ports Authority Port of VI Handbook (Pilbara Ports Authority (2021)	For all spills within Port of VI limits	Notification by Vessel Master, On-scene Commander (OSC), or Emergency Response Team (ERT)	WA DoT POLREP (Appendix C): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf
Department of Biodiversity Conservation and Attractions (State Duty Officer and Pilbara Regional Office)	Verbal notification as soon as reasonably practical	Western Australian Oiled Wildlife Response Plan	Notify if spill has the potential to impact or has impacted wildlife in State waters (to activate the Oiled Wildlife Adviser)	Notification by Planning Section Chief (or delegate)	Not applicable
Department of Primary Industry and Regional Development (DPIRD) Fisheries	Verbal phone call notification within 24 hours of incident	As per consultation with DPIRD Fisheries	Reporting of marine oil pollution[1] Notify if spill has the potential to impact or has impacted fisheries in State waters	Notification by Planning Section Chief (or delegate)	Not applicable

Agency / Authority	Type of Notification / Timing	Legislation / Guidance	Reporting Requirements	Responsible Person / Group	Forms
Department of Water and Environmental Regulation (DWER)	Initial verbal or electronic notification of the discharge as soon as practicable. Written notification of the incident to the CEO of the DWER, copied to the local DWER Industry Regulation Office, as soon as practicable.	*Environmental Protection Act 1986* (Section 72) Environmental Protection (Unauthorised Discharge) Regulations 2004	Call DWER 24-hour Pollution Watch hotline *Environmental Protection Act*: Spill or discharge of hydrocarbons to the environment that has caused, or is likely to cause pollution, or material or serious environmental harm (Level 2 / 3 spills) Environmental Protection (Unauthorised Discharge) Regulations: Unauthorised discharge (where there is potential for significant impact or public interest) to environment of Schedule 1 material	Notification by Planning Section Chief (or delegate)	Reporting requirements: https://www.wa.gov.au/service/environment/pollutant-prevention/pollution-watch
VI Contaminated Sites Auditor *If spill results in shoreline contact at Varanus Island*	Initial verbal or electronic notification followed by a report if confirmed contamination	*WA Contaminated Sites Act 2003*	Applies if there is shoreline contact that could cause land contamination on Varanus Island and/or Airlie Island	Notification by Planning Section Chief (or delegate)	N. A.

1: For clarity and consistency across Santos regulatory reporting requirements, Santos will meet the requirement of reporting a marine oil pollution incident by reporting oil spills assessed to have an environmental consequence of moderate or higher in accordance with Santos' environmental impact and risk assessment process outlined in Section 5 of the EP.

2: Santos reporting requirements only listed. For oil spills from vessels, Vessel Masters also have obligations to report spills from their vessels to AMSA Rescue Coordination Centre (RCC) for spills in Commonwealth waters and to WA DoT MEER in State waters.

Table 7-2: List of spill response support notifications

Organisation	Indicative timeframe	Type of communication	Resources Available	Activation instructions	Santos person responsible for activating
AMOSC Duty Officer	As soon as possible but within two hours of incident having been identified	Verbal Service Contract	Santos is a Participating Member of AMOSC and can call upon AMOSC personnel and equipment (including oiled wildlife). Under the AMOSPlan, Santos can also call upon mutual aid from other trained industry company personnel and response equipment AMOSC's stockpiles of equipment include dispersant, containment, recovery, cleaning, absorbent, oiled wildlife and communications equipment. Equipment is located in Geelong, Fremantle, Exmouth and Broome	**Step 1.** Obtain approval from Incident Commander to mobilise AMOSC. **Step 2.** Notify AMOSC that a spill has occurred. Put on standby as required – activate if spill response escalates in order to mobilise spill response resources consistent with the AMOSPlan. **Step 3.** Email confirmation and a telephone call to AMOSC will be required for mobilisation of response personnel and equipment. Only a Santos call-out authority (registered with AMOSC) can activate AMOSC and will be required to supply their credentials to AMOSC. A signed contract note must also be completed by the Santos call-out authority and returned to AMOSC before mobilisation.	Planning Section Chief (or delegate) will notify AMOSC (upon approval from Incident Commander)
Aviation Service Provider	Within two hours of incident having been identified	Verbal	Helicopters/pilots available for aerial surveillance. Contract in place	Phone call.	Logistics Section Chief (or delegate)
Duty Officers/ Incident Commanders (Woodside, Chevron, Jadestone)	Within two hours of incident having been identified	Verbal	Mutual aid resources (through AMOSC mutual aid arrangement)	Phone call.	Incident Commander (or delegate)
Exmouth Freight & Logistics	Within two hours of incident having been identified	Verbal	Assistance with mobilising equipment and loading vessels	Phone call.	Logistics Section Chief (or delegate)
Waste Service Provider	As required for offshore and shoreline clean-up activities	Verbal	Santos has contract arrangements in place with its waste service provider to take overall responsibility to transport and dispose of waste material generated through clean-up activities	Phone call to the Primary Contact Person. In the event the Primary Contact Person is not available, the Secondary Contact Person will be contacted.	Logistics Section Chief (or delegate)
OSM Services Provider	Operational and Scientific Monitoring Plan initiation criteria are met (Tables 9-1	Verbal and Written	Santos is a member of OSRL's OSM Supplementary Service, providing access	Refer to North West Shelf OSM-BIP (7715-650-ERP-0002) Part B for full activation instructions	Environment Unit Leader (or delegate)

Organisation	Indicative timeframe	Type of communication	Resources Available	Activation instructions	Santos person responsible for activating
	and 9-2 of the Joint Industry OSM Framework [APPEA, 2021]) (Appendix M)		to personnel and equipment for operational and scientific monitoring	**Step 1**. Obtain approval from Incident Commander to activate OSM Services Provide **Step 2.** Verbally notify OSM Services Provider followed by the submission of the Call-off Order Form **Step 3.** OSM Service Provider commences activation process.	
Dispersant Operational Monitoring Provider	When application of dispersant is activated (Section 12.6).	Verbal and Activation Form	Santos' Dispersant Operational Monitoring Provider has been contracted to provide operational dispersant monitoring, including the provision of personnel and equipment.	Phone call to the Dispersant Operational Monitoring Provider – Operational Stand-by Response	Planning Section Chief (or delegate)
Intertek Geotech (WA) Environmental Services and Ecotoxicology	When OMP: Hydrocarbon Properties and Weathering Behaviour is activated (Section 17)	Verbal	Oil analysis including gas chromatography/mass spectrometry fingerprinting	Phone call	Planning Section Chief (or delegate)
Oil Spill Response Limited, OSRL Duty Manager	Within two hours of incident having been identified	Verbal	Santos has a Service Level Agreement with OSRL, which includes the provision of support functions, equipment and personnel to meet a wide range of scenarios At minimum OSRL will provide technical support to the IMT and place resources on standby Further details available on the OSRL webpage.	**Step 1**. Contact OSRL Duty Manager in Singapore and request assistance from OSRL. **Step 2**. Send notification to OSRL as soon as possible after verbal notification. **Step 3**. Upon completion of the OSRL incident notification form, OSRL will plan and place resources on standby. **Step 4**. Mobilisation of personnel (beyond 5 technical advisors x 5 days) and equipment requires signed mobilisation form by designated call-out authorities.	Designated call-out authorities (including Incident Commanders)
The Response Group	As soon as possible but within two hours of incident having been identified	Verbal and written	Santos has arrangements with TRG for the provision of trained field response personnel	Contact TRG Duty Officer	Designated call-out authorities (including Incident Commanders)
RPS Group	As soon as possible but within two hours	Verbal and written	Santos has an agreement in place with RPS Group to allow rapid marine hydrocarbon spill modelling capability to	Contact RPS Group Duty Officer.	Planning Section Chief (or delegate)

Organisation	Indicative timeframe	Type of communication	Resources Available	Activation instructions	Santos person responsible for activating
	of incident having been identified		be activated at any time during activities, which will be undertaken for any spill greater than Level 1. AMOSC can also run modelling on behalf of Santos, if required, as part of contracting arrangements with RPS Group		
Wild Well Control Inc. (WWCI)	Within four hours of a loss of well control incident having been identified	Loss of well control only	Wild Well Control Inc. (WWCI)	As per Source Control Planning and Response Guideline (DR-00-OZ-20001): **Step 1.** Following Santos management confirmation of a loss of well control (LOWC), the Santos Incident Management Team (IMT) Drilling Representative is to call the Wild Well Control 24-hour emergency hotline number to notify WWCI of the incident. **Step 2**. As soon as practical after initial notification and once the scale of the subsea loss of containment is confirmed, an emergency mobilisation authorisation form must be filled out, signed off by the authorised Santos Manager and sent through to WWCI. Obtain the most current emergency mobilisation form from the WWCI emergency hotline attendant. The form shall be submitted as directed by WWCI, as advised by the emergency hotline attendant.	Drilling Representative

Table 7-3: Environmental performance – external notification and reporting

Environmental performance outcome	Make notifications and reports within regulatory and defined timeframes.		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
External notifications and reporting plan	**Response preparedness**		
	Santos Incident Response Telephone Directory (SO-00-ZF-00025.020)	[EPS-RP-001] Incident Response Telephone Directory is revised every six months	Incident Response Telephone Directory; Document revision history
	OPEP communications test	[EPS-RP-002] OPEP contact details for regulatory and service provider notifications are checked annually	OPEP communications test records
	Response implementation		
	External notifications and reporting tables	[EPS-RP-003] External notification and reporting undertaken as per Table 7-1 and Table 7-2.	Incident log

8. Incident action planning

The incident action planning process is built on the following phases:

1. Understand the situation
2. Establish incident priorities, objectives and tasks
3. Develop a plan (IAP)
4. Prepare and disseminate the plan
5. Execute, evaluate and revise the plan for the next operational period.

The Santos IMT will use the IAP process to determine and document the appropriate response priorities, objectives, strategies and tasks to guide the incident response which are reviewed and updated as more information becomes available. The IMT will use an IAP for each operational period following the initial first-strike assessments, notifications and activations undertaken.

When acting as the support agency, Santos may be requested by the Control Agency to develop or support the development of an IAP to help guide the incident response.

The Santos IAP process is built on the phases described in Figure 8-1.

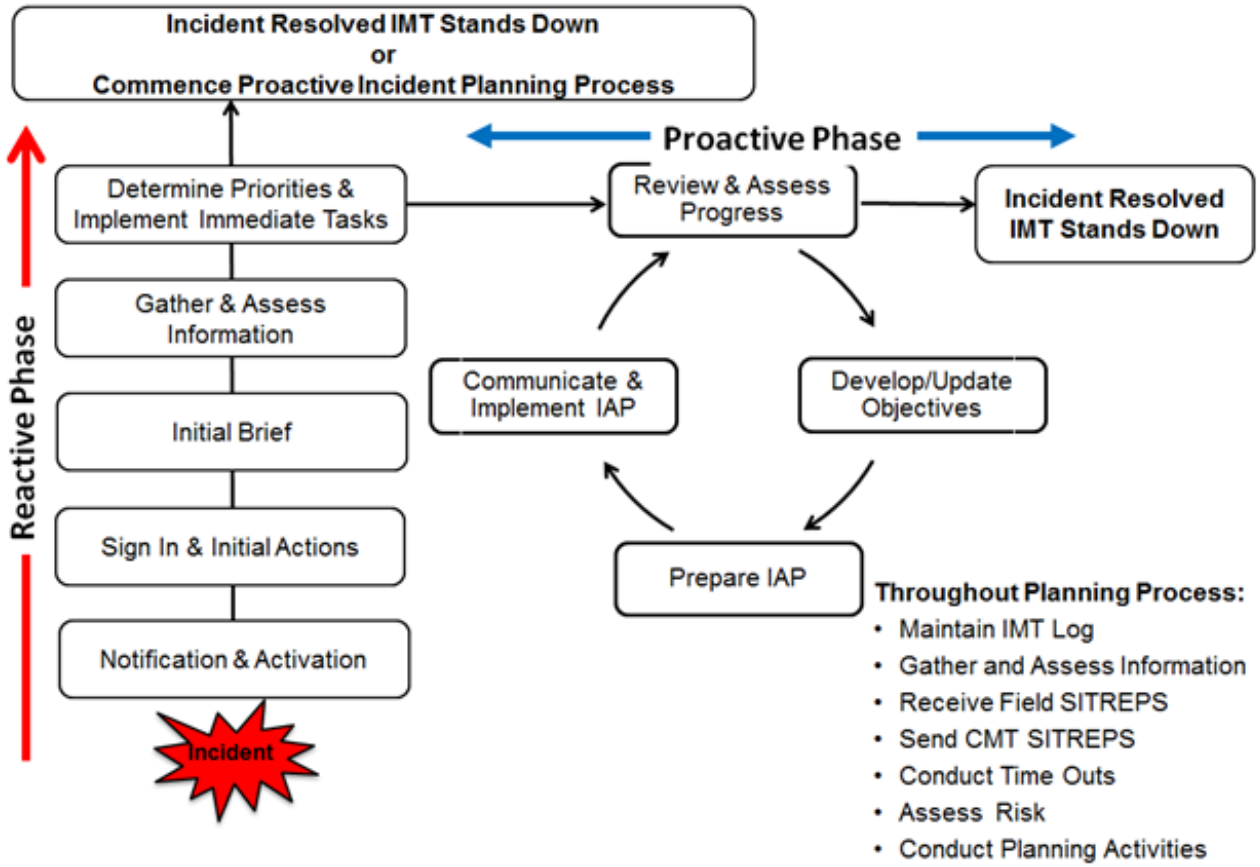

Figure 8-1: Incident action plan process

8.1 Reactive phase planning

The initial phase of the incident action planning process can be considered a reactive phase (indicatively lasting up to 48 hours) where information on the incident is being progressively established through reports coming in from the field. During this phase there is no formal incident action plan to follow (given the incident has just begun and details are still being established) however the OPEP (this document) has been prepared to contain all first-strike oil spill response actions required to be followed during this phase in lieu of a formal IAP.

First-strike response actions are summarised in Table 2-1 and provide links to relevant oil spill strategy sections within the OPEP. These sections contain a more detailed list of implementation actions and considerations as well

as performances standards that must be followed to ensure the initial response meets regulatory requirements and environmental performance outcomes.

For each credible oil spill scenario covered by this OPEP, the first-strike response actions have been informed by a pre-assessment of applicable oil spill response strategies, priority response locations and a strategic NEBA (also referred to as a SIMA). During the reactive phase the strategic NEBA is to be reviewed and, using the specific information gathered from the spill, operationalised into an operational NEBA. This assessment helps verify that the response strategies pre-selected for each spill scenario are providing the best environmental outcome for the incident response.

8.2 Developing an incident action plan

At the end of the reactive phase where the incident specifics have been determined, a more formal phase of spill response is entered whereby a documented IAP is developed to guide the incident response activities for the next operational period. An operational period is defined as the period scheduled for execution of actions specified in the IAP. The next operational period is nominally a daily period but for long running incidents may be extended further where the pace of the incident response has settled, and the level of new information has decreased.

As IAPs and response strategies are implemented their performance is monitored. The performance measurement results are fed back into the IMT to provide the IMT with greater situational awareness to enable the effective formulation of following IAPs. Those response strategies that are effective are continued or increased, while those strategies that are ineffective are scaled back or ceased.

The performance against the objectives of the IAP must be documented in the incident log by the IMT. This provides the IMT with information required to assist in formulating the following IAP and provides evidence of Santos' response to the incident for regulatory and legal investigations that will follow the termination of the incident.

IAP performance is monitored through IMT communication with in-field response personnel both verbally and through logs/reports/photos sent throughout the response (e.g. surveillance personnel, team leaders, laboratory chemists) who report on the effectiveness of the response strategies.

IAP forms and processes are documented in the Santos SharePoint Oil Spill Response Tile and in the SO ER Documentation SharePoint site. Access subfolders to display all forms required to conduct incident action planning. Each functional position within the IMT has subfolders carrying forms and processes unique to the functional position on the Oil Spill Tile.

8.3 Environmental performance

Table 8-1 lists the environmental performance standards and measurement criteria for incident action planning.

Table 8-1: Environmental performance – incident action planning

Environmental performance outcome	Manage incident via a systematic planning process		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Incident action planning	**Response preparedness**		
	IMT Exercise and Training Plan	[EPS-RP-005] Incident action planning and NEBA is practiced by the IMT during exercises	Exercise records
	Response implementation		
	Incident action plan	[EPS-RP-006 Incident action plan is completed for each operational period and approved by the Incident Commander	Incident log Incident action plan/s
		[EPS-RP-007] Monitor effectiveness of response strategies being implemented and use information in the development of IAPs	Incident log Incident action plan/s

Environmental performance outcome	Manage incident via a systematic planning process		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	NEBA	[EPS-RP-008] An operational NEBA will be undertaken for each operational period of the incident	NEBA Incident action plan
	IMT activation and de-escalation	[EPS-RP-009] IMT will be activated Immediately once notified of a Level 2/3 spill (to Incident Commander).	Incident Action Plan
		[EPS-RP-010] The decision to de-escalate the IMT will be made in consultation with the relevant Control Agency/s, Jurisdictional Authorities and other Statutory Authorities that play an advisory role.	NEBA Incident Action Plan
	Tactical Response Plans	[EPS-RP-011] If monitor and evaluate shows that shoreline contact of Protection Priority Areas is likely, TRPs will be developed or sought from other titleholders/ regional industries prior to shoreline contact.	TRP

9. Source control

The initial and highest priority response to an oil spill incident following the health and safety of on-site personnel is to prevent or limit further loss of hydrocarbons to the environment.

For the ongoing response to a LOWC incident, the Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001) is to be consulted as the overarching source of information for implementing a relief well response.

For vessels with a SOPEP, the SOPEP will provide the relevant initial actions to control the source of the spill.

The sections below provide an outline of source control activities noting that the Vessel SOPEP and Source Control Planning and Response Guideline (DR-00-OZ-20001), where applicable, may provide a higher level of detail for specific incidents.

9.1 Vessel collision – fuel tank rupture

Table 9-1 provides the environmental performance outcome, initiation criteria and termination criteria for source control response to a fuel tank rupture. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 9-1: Source control (vessel collision) environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine / onshore environment
Initiation criteria	Notification of a spill
Applicable hydrocarbons	MDO
Termination criteria	Release of oil to the marine environment has ceased and the workplace environment is deemed environmentally safe and free of hydrocarbons

Details of the worse-case spill scenario details are described in Section 6.1.

9.1.1 Implementation guidance

Implementation guidance is summarised in Table 9-2. In the event MDO is released from a vessel due to a tank rupture (involving the FPSO), the relevant vessel-specific procedures will be applied. For vessel collisions, the vessel's SOPEP will be followed to control the source, reduce the loss of hydrocarbons and prevent escalation of the incident. Table 9-6 lists the environmental performance standards and measurement criteria for this strategy.

Table 9-2: Implementation guidance – fuel tank rupture

Action		Consideration	Responsibility	Complete
Initial actions	The vessel's SOPEP, as applicable under MARPOL, or procedure for responding to a ruptured tank will be followed, as applicable.	Notwithstanding vessel-specific procedures for source control, the following activities would be evaluated immediately for implementation, providing it is safe to do so: • Reduce the head of fuel by dropping or pumping the tank contents into an empty or slack tank. • Consider pumping water into the leaking tank to create a water cushion to prevent further fuel inventory loss. • If the affected tank is not easily identified, reduce the level of the fuel in the tanks in the vicinity of the suspected area if stability of the vessel will not be compromised. • Evaluate the transfer of fuel to other vessels. • Trim or lighten the vessel to avoid further damage to intact tanks. • Attempt repair and plugging of hole or rupture.	Vessel Master	☐

9.2 Loss of well control

Table 9-3 provides the environmental performance outcome, initiation criteria and termination criteria for controlling the source of a loss of well control.

Table 9-3: Source control (loss of well control) environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment
Initiation criteria	Loss of well control
Applicable hydrocarbons	Van Gogh crude oil
Termination criteria	The primary well is contained and killed to prevent any further release of hydrocarbon to the environment

The worst-case credible spill scenario for assessment is a subsea LOWC with the release of 1,225 m^3 of Van Gogh crude oil, characterised by a low flow rate of approximately 12.25 m^3/day (~8.5 l/min.), over 100 days.

Details of the worse-case spill scenario details are described in Section 6.1. Source control methods are described in further detail in the following sections.

9.2.1 Relief well drilling

Relief well drilling is the primary source control strategy to control a LOWC. The Source Control Planning and Response Guideline (DR-00-OZ-20001) outlines the overarching process for planning and mobilising personnel and equipment into the field for the purpose of drilling a relief well.

9.2.1.1 Relief well planning

Relief well planning is embedded into the Santos Drilling and Completions Management Process (DCMP). The following industry accepted guidelines have been adopted to assist relief well planning requirements:

- Society of Petroleum Engineers (SPE) Technical Report: Calculation of Worst-Case Discharge (Rev 1) (2016): This is used as part of the prospect screening review to generate a credible rate for oil spill modelling, as well as providing an input for the dynamic kill modelling.
- Offshore Energies UK (OEUK) Relief Well Planning for Offshore Wells Guideline, Issue 3, 2024 (OEUK, 2024): This methodology is used to confirm a well complexity analysis.

To ensure Santos has current MODU availability, Santos maintains a register of MODU activity within the region and updates this on a monthly basis. The relief well rig capability register includes information about:

- MODU name
- MODU contract status (operator and contract duration)
- current location
- maximum water depth capability
- MODU type (floating vs jack-up; mooring type; rig design/class)
- available drilling envelope
- BOP specifications
- BOP connector specifications
- mud pumps specifications/capability
- choke and kill line internal diameters
- storage capability (i.e. diesel, base-oil, brine, drill-water, potable water, bulks)
- NOPSEMA safety case (yes/no).

Relief well planning includes a review of the most recent MODU capability register to identify the most suitable MODU for the well. In the event a suitable MODU is not in Australian waters, or is not predicted to be in Australian

waters at the time of the activity, further work will be completed to identify a regionally suitable MODU, along with a mobilisation plan that demonstrates construction of a relief well within the time frame outlined in Table 9-4 is achievable. Santos will review the MODU Capability Register on a monthly basis for the duration of this OPEP.

In order to facilitate and expedite the use of a regional MODU for relief well drilling an Australian Energy Producers (AEP), formerly Australian Petroleum Production and Exploration Association (APPEA) Memorandum of Understanding: Mutual Assistance is in place. This agreement provides the mechanism to facilitate the transfer of drilling units and well-site services between operators in Australian and Timor Leste administered waters in order to respond urgently to emergency source control events.

A Safety Case Revision will be required for the relief well rig to undertake the activity; this cannot be submitted before the event. The Safety Case Revision will be based on existing documents, including the in-force Safety Case for the relief well rig, if one is available. A Safety Case Revision is to be submitted within 14 days from the well leak, however the critical path time allowed for the preparation of the document is three days. The remaining estimated time would be used for gathering post-event data, mobilising the workforce and conducting a hazard identification. It is not practicable to reduce the critical path days with additional pre-planning as document revision, final review and approval will still be required after completing the hazard identification.

9.2.1.2 Relief well schedule

An indicative relief well drilling schedule is provided in Table 9-4. This is based on control of a blow-out well by 13 weeks (91 days). This period is used as a base case well control timeframe by Santos based on indicative mobilisation durations, relief well planning and operations. It could take up to 47 days to have a MODU on location ready to spud. The base case well control timeframe for drilling a relief well across Santos' other wells is generally 77 days. The additional 14 days is required for this scope based on the planning assumption that a suitable MODU is unlikely to be available in Australian waters. As a result, additional time will be required to mobilise the MODU from international waters (i.e. Singapore) to the operational area. Long lead item equipment to enable a relief well to be drilled within the 91-day timeframe is currently held in the Santos inventory or has been confirmed to be available at short notice from vendors or other operators in the region.

This timeline has been assessed as ALARP based on the current controls/measures in place, however, Santos is actively working with industry to evaluate measures to improve on the ALARP response time model through the AEP Drilling Industry Steering Committee Source Control Response Industry (SCRI) Working Group. The SCRI working group is an initiative established to drive collaboration and continuous improvement in source control emergency response planning. The working group will explore and act on opportunities to align and strengthen the Titleholders' source control emergency response capability through "mutual aid" initiatives and drive continuous improvement by implementing fit-for-purpose and effective source control emergency response strategies.

Note, while 91 days has been assessed as the time within which relief well drilling would be completed, well leak spill modelling conducted to inform risk assessment and spill response planning has been based on a more conservative 100-day relief well drilling period to remain consistent with previous revisions of the EP and OPEP.

Table 9-4: Schedule for MODU arriving on location and relief well drilling

Task	Duration (days)	Controls
LOWC relief well		
• Event reported • Begin sourcing of MODU for relief well drilling operations • Concurrently, stand up relief well drilling team and activate relief well specialists	2	• On-site communications • Active IMT on call including Operations Section Chief/Relief Well Team Lead • Stand-up relief well team (as per Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001) • Relief Well Drilling specialist services contract (Wild Well Control) • Regional MODU tracking • AEP (formerly APPEA) MoU: Mutual Assistance
• Relief well MODU confirmed. Relief well MODU suspends operations and prepares to mobilise to relief well location • Demobilisation of equipment from previous operator • Concurrently, prepare relief well MODU Safety Case Revision (SCR) and submit to NOPSEMA	7	• Active IMT • Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001) • Pre-completed well specific Source Control Plan complete with relief well study • Relief Well Drilling specialist services contract (Wild Well Control)

Task	Duration (days)	Controls
• Concurrently, prepare relief well design and dynamic kill plan. Prepare Well Management Plan (WMP) and submit to NOPSEMA		• Regional MODU tracking • AEP (formerly APPEA) MoU: Mutual Assistance • Access relief well long lead equipment from inventory or other operators (e.g. casing and wellhead) • Drilling services contracted
• Contract relief well MODU • Concurrently, continue preparations for rig mobilisation • Concurrently, NOPSEMA assessment of relief well MODU SCR and relief well WMP • Mobilise relief well MODU to location.	38	• Active IMT • Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001) • Relief Well Drilling specialist services contract (Wild Well Control)
Total days prior to arrival, ready to spud/commence relief well operations	**47**	
• Drill and construct relief well and complete dynamic well kill operations	44	• Active IMT • Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001) • Relief Well Drilling specialist services contract (Wild Well Control)
Total days from LOWC notification to well kill	**91**	

9.2.2 Implementation guidance

Relief well drilling is the primary source control strategy to control a LOWC during Ningaloo Vision CoPFAR activities.

The Source Control Planning and Response Guideline (DR-00-OZ-20001) outlines the overarching process for planning and mobilising personnel and equipment into the field for relief well source control methods.

Implementation guidance for source control implementation actions is provided in Table 9-5.

Table 9-5: Implementation guidance – loss of well control

Action		Responsibility	Complete
Initial Actions	**Relief well**		
	Implement the Source Control Planning and Response Guideline (DR-00-OZ-20001).	Relief Well Team Leader	☐
	Notify Santos Drilling and Completions Team to assemble a Source Control Branch and immediately begin preparations.	Relief Well Team Leader	☐
	Notify well control service provider personnel for mobilisation.	Relief Well Team Leader and Source Control Branch Director	☐
	Source MODU through nearby drilling operations if available or procure from nearest operator through mutual aid agreement MoU.	Source Control Branch Director	☐
	Refine, as necessary, the relief well pre-planned work described in Section 9.2.1 to reflect the actual depths and asses the suitability of well locations.	Source Control Branch Director	☐
	Assess relief well equipment and personnel requirements. Procure and make ready.	Logistics Section Chief Section Chief	☐
	Deploy equipment and personnel to site to begin operations.	Relief Well Team Leader	☐
Ongoing Actions	**Relief well**		
	Design Relief Well, using relief well pre-planning work.	Source Control Branch Director	☐
	Assess relief well equipment and personnel requirements. Procure and make ready.	Logistics Section Chief	☐
	Deploy equipment and personnel to site to begin operations.	Relief Well Team Leader	☐
	Monitor progress of relief well drilling and communicate to IMT.	Relief Well Team Leader	☐

9.3 Environmental performance

Table 9-6 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 9-6: Environmental performance – source control

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment		
Response Strategy	**Control Measures**	**Performance Standards [EPS ID]**	**Measurement Criteria**
Response Preparedness			
Source control - vessel collision	Vessel Spill Response Plan (SOPEP/SMPEP)	[EPS-SC-001] Activity/support vessels have a SOPEP or shipboard marine pollution emergency plan (SMPEP) that outlines procedures to combat spills	Audit records. Inspection records
	Exercises conducted as per Vessel Spill Response Plan (SOPEP/SMPEP)	[EPS-SC-002] Spill exercises on activity/support vessels are conducted as per the vessels' SOPEP or SMPEP	Spill exercise close-out reports
Source control – relief well drilling	Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) provides guidance for well specific source control planning and response, and includes the Santos Source Control Emergency Response Plan in Section 7	[EPS-SC-022] The Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) is in place and up to date during the activity.	Source Control Planning and Response Guideline (DR-00-OZ-20001)
	Contract and Equipment Access Agreement with Wild Well Control (WWCI)	[EPS-SC-024] Contract and Equipment Access Agreement with WWCI are maintained providing technical support and equipment	Contract with WWCI
	Arrangements for source control emergency response personnel	[EPS-SC-025] Arrangements for access to source control personnel are maintained during the activity	Contract/ Memorandums of Understanding for source control personnel
	Relief Well Rig Capability Register is maintained during the activity to monitor MODUs potentially available for relief well drilling.	[EPS-SC-026] Relief Well Rig Capability Register, to monitor rigs currently present in Australasia and record relevant details including rig specifications, contract status and safety case approvals, is maintained during the activity through monthly monitoring.	Relief Well Rig Capability Register
Response Implementation			
Source control - vessel collision	Vessel Spill Response Plan (SOPEP/SMPEP) implemented	[EPS-SC-003] Actions to control spill associated with a vessel incident followed in accordance with SOPEP or SMPEP	Vessel logs

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment		
Response Strategy	**Control Measures**	**Performance Standards [EPS ID]**	**Measurement Criteria**
Source control – relief well drilling	Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) provides guidance for well specific source control planning and response, and includes the Santos Source Control Emergency Response Plan in Section 7	[EPS-SC-028] Relief well drilling implemented in accordance with the Source Control Planning and Response Guideline (DR-00-OZ-20001) during a well release	Incident log
	Santos Source Control Branch	[EPS-SC-029] Source Control Branch mobilised within 24 hours of being notified of the well release	Incident log
	Equipment / services for relief well drilling	[EPS-SC-030] Equipment / services for relief well drilling sourced within 5 days of the well release being identified	Incident log
	Well control specialists	[EPS-SC-031] Well control specialists mobilised within 72 hours of being notified of the well release	Incident log
	Relief well MODU	[EPS-SC-032] MODU for relief well drilling to be onsite by Day 47 from the start of a well release	Incident log
	Relief well construction	[EPS-SC-033] Relief well completed within 91 days from start of well release	Incident log

10. Monitor and evaluate

Understanding the behaviour and likely trajectory of an oil spill is critical to evaluate the appropriate response strategy. There are a number of methods that can be used to monitor and evaluate, including:

- vessel surveillance
- aerial surveillance
- tracking buoys
- oil spill trajectory modelling
- satellite imagery

10.1 Vessel surveillance

Table 10-1 lists the environmental performance outcome, initiation and termination criteria for this strategy.

Table 10-1: Vessel surveillance – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement monitor and evaluate methods in order to provide situational awareness to inform IMT decision-making	
Initiation criteria	Notification of a Level 2/3 spill – may be deployed in a Level 1 incident (to be determined by OSC)	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓1	✓1
Termination criteria	• Vessel-based surveillance is undertaken at scheduled intervals during daylight hours and continues for 24 hours after the source is under control and a surface sheen is no longer observable, or • NEBA is no longer being achieved, or • Agreement is reached with Jurisdictional Authorities to terminate the response.	

Direct observations from field support or other vessels can be used to assess the location and visible extent of the hydrocarbon incidents, and to verify modelling predictions and trajectories. Due to the proximity of observers to the water's surface, vessel surveillance is limited in its coverage in comparison to aerial surveillance and may also be compromised in rough sea-state conditions or where fresh hydrocarbons at surface pose safety risks.

10.1.1 Implementation guidance

Table 10-2 provides guidance to the IMT on the actions and responsibilities to be considered when selecting this strategy. Table 10-3 has a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to start initial vessel surveillance operations are listed in Table 10-4. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-21 lists the environmental performance standards and measurement criteria for all monitor and evaluate methods including this strategy.

Table 10-2: Implementation guidance – vessel surveillance

Action		Consideration	Responsibility	Complete
Initial actions	Notify nearest available support vessel to commence surveillance.	Current Santos on hire vessels or vessels of opportunity (VOO) can be used. Automatic Identification System (AIS) vessel tracking is available through Emergency Response (ER) intranet page.	On-Scene Commander Operations Section Chief	☐
	Source additional contracted vessels if required for assistance.	Refer to Santos Vessels for Oil Spill Response (7110-650-ERP-0001) for guidance on vessel availability monitoring and vessel types.	Logistics Section Chief	☐
	Record surface slick location and extent, weather conditions, and marine fauna. Complete vessel surveillance forms (Appendix E) and provide to On-Scene Commander (Level 1 spills) or IMT (Level 2/3 spills).	Photographic images are to be taken where possible and included with surveillance forms. Trained observers will not be available immediately – photos and locations will provide initial information that can be interpreted by IMT.	Vessel Observers	☐
	Relay surveillance information (spill location, weather conditions, marine fauna sightings and visual appearance of the slick) to the IMT within 60 minutes of completing vessel surveillance.	Initial reports to the IMT may be verbal (followed by written transmission) if the vessel is out of range or has no facilities for transmitting forms.	Vessel Master and/or On-Scene Commander	☐
Ongoing actions	Review surveillance information to validate spill fate and trajectory.	-	Planning Section Chief / GIS Team Leader	☐
	Use available data to conduct operational NEBA and confirm that pre-identified response options are appropriate.	-	Environment Unit Leader	☐
	Use monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required	Surveillance data is useful in updating the Common Operating Picture	Planning Section Chief	☐

Table 10-3: Vessel surveillance resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Contracted vessels and vessels of opportunity	Santos Contracted Vessel Providers Vessels of opportunity identified through AIS Vessel Tracking.	Availability dependent upon Santos and vessel contractor activities. Santos on-hire vessels include Varanus Island Field Support Vessel	Vessels mobilised from Dampier, Varanus Island, Exmouth or offshore location. Locations verified through AIS Vessel Tracking Software.	Pending availability and location. Expected within 12 hours.

Table 10-4: Vessel surveillance – first-strike response timeline

Task		Time from IMT call-out
IMT begins sourcing Santos-contracted vessel or VOO for on-water surveillance		<90 minutes
Santos-contracted vessel or VOO on site for surveillance		<24 hours (daylight dependent)
Minimum resource requirements		
One vessel. No specific vessel or crew requirements.		
Deployment location	**Approx. distance to operational area[16] (nautical miles)**	**Approx. steam time[17] (hours: minutes)**
Exmouth	37 (68 km)	3:40
Varanus Island	96 (178 km)	9:40
Dampier	155 (286 km)	15:30

10.2 Aerial surveillance

Table 10-5 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-5: Aerial surveillance – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	
Initiation criteria	Notification of a Level 2/3 spill	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓1	✓1
Termination criteria	• Aerial surveillance undertaken at scheduled intervals during daylight hours and continues for 24 hours after the source is under control and a surface sheen is no longer observable, OR • As directed by the relevant Control Agency	

Aerial surveillance is used to record the presence and size of the hydrocarbon spill at surface as well as other environmental observations including weather conditions, marine fauna and sensitive receptors in the area. Aerial surveillance provides superior coverage over vessel surveillance for estimating the spatial extent of a spill but is generally required only for larger Level 2/3 spills.

10.2.1 Implementation guidance

Table 10-6 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 10-7 provides a list of resources that may be used to implement this strategy.

[16] *As measured to geometric centre point of operational area*

[17] *At average rate of 10 knots*

Mobilisation times for the minimum resources that are required to commence initial aerial surveillance operations are listed in Table 10-8. The On-Scene Commander and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-6: Implementation guidance – aerial surveillance

Action		Consideration	Responsibility	Complete
Initial actions	Contact contracted aviation provider – provide details of incident and request mobilisation to spill site for initial surveillance.	If aviation asset is available near spill location, use where possible to gather as much information about the spill. If aviation asset is not available at spill location IMT is to seek available resources through existing contractual arrangements. It is possible that the initial surveillance flight will not include a trained aerial surveillance observer. Initial flights can be conducted using a standard crew and initial surveillance should not be delayed waiting for trained personnel. Ensure all safety requirements are met before deployment. There should be an attempt to obtain the following data during initial surveillance: • name of observer, date, time, aircraft type, speed and altitude of aircraft • location of slick or plume (global positioning system [GPS] positions, if possible) • spill source • size of the spill, including approximate length and width of the slick or plume • visual appearance of the slick (e.g. colour) • edge description (clear or blurred) • general description (windrows, patches etc.) • wildlife, habitat or other sensitive receptors observed • basic metocean conditions (e.g. sea state, wind, current) • photographic/video images.	Operations Section Chief Logistics Section Chief	☐
	Source available Santos Aerial Observers, arrange accommodation/logistics and deploy to Forward Operations/Air base location.	Santos Aerial Observer list available from First-strike Resources on Santos Offshore ER Intranet page.	Operations Section Chief Logistics Section Chief	☐
	Develop flight plan (frequency and flight path) to meet IMT expectations and considering other aviation operations. Expected that two overpasses per day of the spill area are completed.	Flight plan to confirm with OSC that aircraft are permitted in the vicinity of the spill. Flights are only to occur during daylight and in weather conditions that do not pose significant safety risks.	Operations Section Chief / Aviation Superintendent	☐
	Pre-flight briefing.	-	Aerial Observers Contracted aircraft provider/pilots	☐
	Aerial Observers to commence surveillance	Consider procedure for interacting with marine fauna.	Operations Section Chief	☐
	Determine spill extent by completing Aerial Surveillance Log (Appendix F) and Aerial Surveillance Surface Slick Monitoring Template. Calculate volume of oil	Thickness estimates are to be based on the Bonn Agreement Oil Appearance Code (BAOAC).	Aerial Observer	☐

Action		Consideration	Responsibility	Complete
	(Appendix G). Take still and/or video images of the slick.			
	Record presence and type of fauna by completing the Aerial Surveillance Marine Fauna Sighting Record Sheet (Appendix H).	Provide a copy of completed Record Sheets to Environment Unit Leader- and OSM Implementation Lead.	Aerial Observer	☐
	Record shoreline habitat type and degree of oiling by completing the Aerial Surveillance Shoreline Observation Log (Appendix I)	Thickness estimates are to be based on the BAOAC (Appendix F)	Aerial Observer	☐
	Relay all surveillance records (logs, forms, photographic images, video footage) to the IMT.	Where possible, a verbal report via radio/telephone en-route providing relevant information should be considered if the aircraft has long transits from the spill location to base.	Aerial Observer Planning Section Chief Operations Section Chief	☐
Ongoing actions	Update flight schedule for ongoing aerial surveillance as part of the broader Aviation Subplan of the IAP	Frequency of flights should consider information needs of IMT to help maintain the Common Operating Picture and determine ongoing response operations.	Operations Section Chief / Aviation Superintendent Planning Section Chief	☐
	Mobilise additional aircraft and trained observers to the spill location to undertake ongoing surveillance activities	-	Logistics Section Chief	☐
	Update Common Operating Picture with surveillance information and provide updates to spill trajectory modelling provider	-	Planning Section Chief GIS Team Leader	☐

Table 10-7: Aerial surveillance resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Rotary-wing aircraft and flight crew	Santos contracted provider/s	• 2 x contracted (1 x primary + 1 x backup) • Additional as required	Karratha	Activation of aerial surveillance using helicopter pilots will occur <3 hours of notification of the spill. Helicopter on site for surveillance <6 hours of the spill (daylight dependent).
Aerial surveillance Crew	Santos aerial observers	• 7 x Santos staff	Perth and VI	24 hours - available from Day 2 of the incident
	AMOSC / Industry Mutual Aid	• 4 x AMOSC staff • 2 x AMOSC Core Group personnel available • Additional trained industry mutual aid personnel	Australia wide	24 hours - available from Day 2 of the incident
Drones and pilots **secondary response to assist vessel-based surveillance	AMOSC	• 1 x Phantom 4 drone • 1 x pilot	Fremantle	Response via duty officer within 15 minutes of first call – AMOSC personnel available within 1 hour of initial activation call. Equipment logistics varies according to stockpile location (refer to Table 10-12)
	OSRL – Third-Party UAV provider	• 2 x qualified remote pilots, however response is on best endeavour	Australia / international	Depending on the port of departure, one to two days if within Australia
	Local WA hire companies	• 10+	Perth and regional WA	

Table 10-8: Aerial surveillance – first-strike response timeline

Task	Time from IMT call-out
Aircraft activated for aerial surveillance	<3 hours
Aircraft on site for aerial surveillance	<6 hours (helicopter, daylight dependent)
Trained Aerial Observers mobilised to airbase (Exmouth/Dampier)	24–48 hours (from Day 2) (daylight dependent)

Minimum resource requirements		
• Santos contracted helicopter and pilots (based in Dampier) • Santos trained Aerial Observers		
Airport	**Approx. distance[18] (nm)**	**Approx. flight time[19] (hours: minutes)**
Exmouth (Learmonth)	51 (94 km)	0:25
Dampier (Karratha)	156 (290 km)	1:20

[18] *As measured to geometric centre point of operational area*

[19] *At average flight speed of 120 knots*

10.3 Tracking buoys

Table 10-9 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-9: Tracking buoys – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	
Initiation criteria	Notification of a Level 2 or 3 spill May be deployed for a Level 1 spill if deemed beneficial by the OSC	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓1	✓1
Termination criteria	• Tracking buoy deployment will continue for 24 hours after the source is under control and a surface sheen is no longer observable, OR • As directed by the relevant Control Agency	

10.3.1 Implementation guidance

Table 10-10 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 10-11 provides a list of resources that may be used to implement this strategy.

Table 10-12 provide a summary of AMOSC equipment mobilisation timeframes. Mobilisation times for the minimum resources that are required to commence implementation of this tactic are listed in Table 10-13. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned. Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-10: Implementation guidance – tracking buoys

	Action	Consideration	Responsibility	Complete
Initial actions	Organise vessel to mobilise two tracking buoys from Exmouth	Personnel and vessel safety is priority. Current Santos on hire vessels or VOOs can be used. AIS vessel tracking is available through ER intranet page.	OSC / Operations Section Chief	☐
	Deploy two tracking buoys at leading edge of slick.	Note deployment details and weather conditions in the incident log.	Vessel Master	☐
	Inform IMT that tracking buoys have been deployed and provide deployment details. Monitor movement of tracking buoys.	Refer login details of tracking buoy monitoring website on Santos ER intranet site.	OSC Planning Section Chief / GIS Team Leader	☐
	Use tracking buoy data to maintain Common Operating Picture.	Data tracked online.	Planning Section Chief / GIS Team Leader	☐
	Relay information to spill fate modelling supplier for calibration of trajectory modelling.	-	Planning Section Chief / GIS Team Leader	☐
Ongoing actions	Assess the need for additional tracking buoys in the spill scenario and identify/nominate preferred deployment locations.	IAP to provide guidance regarding any additional deployments of tracking buoys.	Planning Section Chief	☐
	Mobilise additional tracking buoys if required from other Santos operations (Santos presently has 12 tracking buoys located on the North West Shelf) and an additional 8 from AMOSC stockpiles.	-	Logistics Section Chief	☐
	Organise vessel to deploy additional tracking buoys if required.	For continuous releases over multiple days use a rolling deployment/collection of tracking buoys to provide better coverage of plume direction.	Operations Section Chief	☐
	Deploy tracking buoys.	-	Vessel Master	☐
	Monitor movement of tracking buoys.	-	Planning Section Chief /GIS Team Leader	☐
	Relay information to spill trajectory modelling supplier for calibration of trajectory modelling.	-	Planning Section Chief /GIS Team Leader	☐

Table 10-11: Tracking buoy resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Tracking buoys	Santos	2	Exmouth Supply Base	<6 hours for incident
		4	Varanus Island	<12 hours to site pending vessel availability
		6	Dampier	12–24 hours to site pending vessel availability
AMOSC tracking buoys	AMOSC	4	Fremantle	Response via Duty Officer within 15 minutes of first call – AMOSC personnel available <1 hour of initial activation call. Equipment logistics varies according to stockpile location (refer to Table 10-12)
		4	Geelong	

Table 10-12: Australian Marine Oil Spill Centre equipment mobilisation timeframes (road freight)

	Perth	Dampier	Exmouth
Perth	NA	19 hours / 1,530 km	15 hours / 1,250 km
Exmouth	15 hours / 1,250 km	7 hours / 555 km	N/A
Broome	27 hours / 2,240 km	11 hours / 855 km	15 hours / 1,135 km
Geelong	40 hours / 3,395 km	70 hours / 4,840 km	65 hours / 4,510 km

Table 10-13: Tracking buoy – first-strike response timeline

Task	Time from IMT call-out
Two tracking buoys deployed from Exmouth using vessels of opportunity.	<12 hours pending vessel availability
Minimum Resource Requirements	
• Two tracking buoys for initial deployment	

10.4 Oil spill trajectory modelling

Table 10-14 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-14: Oil spill trajectory modelling – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	
Initiation criteria	Notification of a Level 2 or 3 spill	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓1	✓1
Termination criteria	• Spill fate modelling will continue for 24 hours after the source is under control and a surface sheen is no longer observable, or until no longer beneficial to predict spill trajectory and concentrations, OR • As directed by the relevant Control Agency	

Oil spill trajectory modelling uses computer modelling (e.g. OILMAP, SIMAP) to estimate the movement, fate and weathering potential of spills. Santos has engaged RPS Group to provide forecast spill fate modelling. RPS Group use SIMAP and OILMAP modelling systems that comply with Australian Standards (ASTM Standard F2067-22: Standard Practice for Development and Use of Oil Spill Trajectory Models). RPS Group also provide the capacity for forecast air quality monitoring to enable an assessment of potential health and safety risks associated with VOCs released from a surface slick.

A particular advantage of spill trajectory modelling is that the transport and weathering of spilled hydrocarbons can be forecast, at all times of the day and night, at any location, and under any type of metocean conditions. By contrast, aerial surveillance and vessel-based monitoring will be constrained to daytime use, and have limits imposed by the operating environment. Aerial surveillance and vessel-based monitoring are, however, essential for model validation, verification and calibration of any modelling or first principal predictions.

10.4.1 Implementation guidance

Table 10-15 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 10-16 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence implementation of this tactic are listed in Table 10-17. The Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned. Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-15: Implementation guidance – oil spill trajectory modelling

Action		Consideration	Responsibility	Complete
Initial actions	Initiate oil spill trajectory modelling (OSTM) by submission of an oil spill trajectory modelling request form (Santos ER SharePoint). Request for three-day forecast trajectory modelling.	-	Environment Unit Leader	☐
	Determine requirement for gas/VOC modelling and request initiation.	Hydrocarbon releases have human health and safety considerations for responders (volatile gases and organic compounds). This is to be considered for any tactics that monitor/recover oil, especially at close proximity to release site.	Safety Officer Environment Unit Leader	☐
	Operational surveillance data (aerial, vessel, tracking buoys) to be given to modelling provider to verify and adjust fate predictions of the spill and improve predictive accuracy.	-	Planning Section Chief /GIS Team Leader	☐
	Login to the RPS Group data sharing website and maintain connection. Download modelling results.	Data should be stored digitally and backed up on to independent digital storage media. All datasets should be accompanied by a metadata summary and documented quality assurance and control procedures.	Planning Section Chief /GIS Team Leader	☐
	Place RPS Group modelling data into GIS/Common Operating Picture.	RPS Group to provide at least daily updates to the IMT of trajectory model outputs to inform response planning. More frequent updates can be provided if weather conditions are highly variable or change suddenly.	Planning Section Chief /GIS Team Leader	☐
	If chemical dispersants are considered applicable strategy for spill scenario, request modelling provider to model how dispersant addition effects the distribution and concentration of floating oil, subsea oil and shoreline loading.	Planning and Operations to provide inputs for modelled simulation based on potential/planned dispersant operations. Outputs from dispersant addition modelling to inform NEBA.	Planning Section Chief Operations Section Chief	☐
	Identify location and sensitivities at risk based on the trajectory modelling and inform IMT. Conduct operational NEBA on proposed response strategies.	-	Environment Unit Leader	☐
Ongoing actions	Request spill trajectory modelling be provided daily throughout the duration of the response and integrate data into Common Operating Picture.	-	Planning Section Chief / GIS Team Leader	☐
	Use results from other monitor and evaluate activities, and/or data derived from hydrocarbon assays of the source hydrocarbon or from other reservoirs in the region (that may be available) as input data (if or when available) to improve model accuracy.	-	Planning Section Chief / GIS Team Leader	☐

Table 10-16: Oil spill trajectory modelling resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
RPS OST modellers and software	RPS Group under direct contract to Santos, also available through AMOSC	Daily OSTM reports	Perth – digital	2–4 hours from activation

Table 10-17: Oil spill trajectory modelling – first-strike response timeline

Task	Time from IMT call-out
RPS Group OSTM activated by IMT	<2 hours
OSTM provided to IMT	<4 hours
Minimum Resource Requirements	
• Contracted OST modellers and software • OSTM Activation Form	

10.5 Satellite imagery

Table 10-18 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-18: Satellite imagery – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	
Initiation criteria	Notification of a Level 2 or 3 spill	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓1	✓1
Termination criteria	• Satellite monitoring will continue until no further benefit is achieved from continuing; or as advised by relevant Control Agency.	

Satellite imagery is considered a supplementary source of information that can improve awareness but is not critical to the response and usage is at the discretion of the IMT.

Suitable imagery may be available via satellite imagery suppliers. This can be requested through existing AMOSC and OSRL contracts. The most appropriate images for purchase will be based on the extent and location of the oil spill. Synthetic aperture radar and visible imagery may both be of value. Availability of satellite images for a specific location will be dependent on several factors including satellite current position, satellite availability/tasking and weather conditions (cloud cover obscures images).

10.5.1 Implementation guidance

Table 10-19 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 10-20 provides a list of resources that may be used to implement this strategy. The Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned. Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-19: Satellite imagery implementation guide

Action		Consideration	Responsibility	Complete
Initial actions	Assess requirement for satellite imagery.	-	Planning Section Chief	☐
	Notify AMOSC and OSRL Duty Officer to initiate request for available satellite imagery.	Formal written activation of resources from AMOSC and OSRL by designated call-out authorities	Planning Section Chief	☐

Action		Consideration	Responsibility	Complete
		(Santos Duty Managers/Incident Commanders) is required.		
	Assess suitability and order imagery.	-	Planning Section Chief	☐
	Integrate satellite imagery into Common Operating Picture and provide to trajectory modelling provider for model validation.	-	GIS Team Leader Planning Section Chief	☐
Ongoing actions	Review satellite imagery to validate spill fate and trajectory.	-	Planning Section Chief	☐
	Use satellite imagery to periodically reassess the spill and modify the response (through the IAP), as required.	Use surveillance data when updating the Common Operating Picture.	Planning Section Chief	☐

Table 10-20: Satellite imagery resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Satellite Imagery	KSAT – activated through AMOSC MDA – activated through OSRL	Dependent upon overpass frequency (TBC on activation)	Digital	If satellite images are required, Santos to notify provider within 12 hours

10.6 Environmental performance

Table 10-21 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 10-21: Environmental performance – monitor and evaluate

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision making		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Monitor and evaluate – vessel and aerial surveillance	**Response Preparedness**		
	Maintenance of MSAs with multiple vessel providers for surveillance vessel capability	[EPS-ME-001] Santos maintains MSAs with multiple vessel providers as specified in Table 10-3.	MSAs with vessel providers
	Minimum specifications list for surveillance vessels	[EPS-ME-002] Maintain minimum specifications list for surveillance vessels to aid in rapid vessel selection	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Track location of potential surveillance vessels	[EPS-ME-003] Santos maintains access to Automatic Identification System (AIS) Vessel Monitoring System to track potential surveillance vessel locations.	AIS live tracking portal
	MSA with aviation supplier for aerial surveillance capability	[EPS-ME-009] MSA in place with helicopter/aircraft provider throughout activity	MSA with aviation supplier
	Trained aerial observers available through Santos personnel	[EPS-ME-010] Santos maintains a pool of trained aerial observers	Exercise Records Training Records
	Trained aerial observers available through mutual aid arrangements facilitated by AMOSC	[EPS-ME-011] Maintenance of AMOSC contract to facilitate mutual aid arrangements for access to Trained Aerial Observers	AMOSC Participating Member Contract
	Access to certified UAV providers	[EPS-ME-012] Maintenance of contract for access to UAV providers	List of certified UAV providers AMOSC Participating Member contract OSRL Associate Member contract
	Aircraft charter companies for fauna observations	[EPS-ME-013] Maintain a list of aircraft charter companies that could potentially provide fauna observation services	List of providers
	Response Implementation		
	Vessel surveillance First Strike capability mobilised	[EPS-ME-004] First strike is mobilised in accordance with details and timings as specified in Table 10-4	Incident log
	Vessel surveillance daily observation reports	[EPS-ME-007] Daily observation reports submitted to IMT until termination criteria is met	Incident log
	Vessels and chartered surveillance aircraft compliant with Santos'	[EPS-ME-006] Vessels comply with Santos' Protected Marine Fauna	Vessel contractor procedures align with Santos's *Protected*

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision making		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003)	Interaction and Sighting Procedure (EA-91-11-00003) which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 which includes controls for minimising the risk of collision with marine fauna	*Marine Fauna Interaction and Sighting Procedure*; Completed vessel statement of conformance
		[EPS-ME-014] Chartered surveillance aircraft comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 which includes controls for minimising interaction with marine fauna	Aircraft contractor procedures align with Santos' *Protected Marine Fauna Interaction and Sighting Procedure*
	Aerial surveillance First strike capability mobilised	[EPS-ME-015] First strike is mobilised in accordance with details and timings as specified in Table 10-8	Incident log
	Aerial surveillance – two passes per day	[EPS-ME-016] Following initiation of aerial surveillance, two passes per day of spill area by observation aircraft	Incident log IAP
	Aerial surveillance trained aerial observers	[EPS-ME-017] Trained Aerial Observers supplied from Day 2 of response	Incident log
	Aerial surveillance flight schedules	[EPS-ME-019] Flight schedules are maintained throughout response	IAP
	Aerial surveillance observer log	[EPS-ME-020] Observers completed aerial surveillance observer log following completion of flight	Completed Aerial Surveillance Observer Logs
Monitor and evaluate – tracking buoys	**Response Preparedness**		
	Tracking buoys available	[EPS-ME-023] Maintenance of 12 tracker buoys throughout the activity	Computer tracking software Tracking buoy tests
	Response Implementation		
	Tracking buoy first strike capability mobilised	[EPS-ME-024] First strike is mobilised in accordance with details and timings as specified in Table 10-11	Incident log
Monitor and evaluate – oil spill modelling	**Response Preparedness**		
	Maintenance of contract for emergency response modelling	[EPS-ME-027] Maintenance of contract for forecast spill trajectory modelling services throughout activity	Modelling services contract

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision making		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	Maintenance of access to additional emergency response modelling	[EPS-ME-028] Access to additional spill modelling capability to ensure redundancy.	Membership in place with OSRL
	Response Implementation		
	Oil spill modelling provider first contact	[EPS-ME-029] Oil Spill Modelling provider will be contacted within 2 hours upon notification of a Level 2 or 3 spill	Incident log
	Oil spill modelling provider output minimum timings	[EPS-ME-030] Modelling delivered to IMT within two hours of request to service provider	Incident log
Monitor and evaluate – satellite imagery	**Response Preparedness**		
	Satellite imagery and analysis capability	[EPS-ME-032] Satellite imagery and analysis accessed through third party provider activated through AMOSC and/or OSRL	AMOSC Participating Member contract, OSRL Associate Member contract
	Response Implementation		
	Satellite imagery and analysis provided to IMT	[EPS-ME-033] Data incorporated into Common Operating Picture and provided to spill modelling provider	Incident log IAP

11. Mechanical dispersion plan

Table 11-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 11-1: Mechanical dispersion – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	To create mixing for oil and water to enhance natural dispersion and biodegradation	
Initiation criteria	Monitor and evaluate data identifies thin oil patches at sea surface that are not naturally dissipating in sea surface and is posing risks to wildlife and shorelines by remaining on the surface	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓2	**✓2**
Termination criteria	• There is no longer a noticeable reduction of surface oil resulting from the activity, or • NEBA is no longer being achieved, or • Unacceptable safety risks associated with gas and VOCs at the sea surface, or • Agreement is reached with Jurisdictional Authorities to terminate the response	

11.1 Overview

This response strategy assists with the natural dispersion process; creating mixing through physical agitation by using a vessel's propellers and wake, which encourages the oil to break into smaller particle sizes that are more easily biodegraded. The two common activities associated with mechanical dispersion are:

- manoeuvring a vessel through the slick, using propeller wash and vessel wake to create mixing in the water body
- spraying water from the fire hose of a vessel and moving the vessel through the water body to create additional mixing and breakup of the slick.

11.2 Implementation guidance

Table 11-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 11-3 provides a list of resources that may be used to implement this strategy. The OSC/Vessel Master and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 11-2: Implementation guidance – mechanical dispersion

Action		Consideration	Responsibility	Complete
Initial actions	The operational NEBA will confirm the suitability and environmental benefit of conducting mechanical dispersion at appropriate locations.	Water depth and sea state. Possible impacts to sensitive shorelines and/or wildlife. This activity is to be conducted during daylight hours only and requires a safety plan to be developed prior to implementation.	Operations Section Chief Environment Unit Leader Planning Section Chief	☐
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls).	-	Operations Section Chief Safety Officer	☐
	Notify vessel-based responders to trial mechanical dispersion.	-	Operations Section Chief	☐
	Response personnel on vessels to evaluate the effectiveness of the use of mechanical dispersion operations to reduce the volume of oil on the water surface. Communicate the information to the IMT Operations Section Chief for inclusion in operational NEBA.	-	Vessel Master/s Santos AMOSC Core Group Responders	☐

Table 11-3: Mechanical dispersion resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Vessel(s) undertaking other activities Vessel(s) can be specifically contracted for the strategy if required (refer to *Santos Vessel Requirements for Oil Spill Response* document [7710-650-ERP-0001])	Santos contracted vessel providers	Availability dependent upon Santos and vessel contractor activities.	Vessels mobilised from Varanus Island, Dampier, Exmouth and/or NW locations. Locations verified through AIS Vessel Tracking Software.	Varies subject to availability and location.

11.3 Environmental performance

Table 11-4 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 11-4: Environmental performance – mechanical dispersion

Environmental performance outcome	To create mixing for oil and water to enhance natural dispersion and biodegradation		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Mechanical dispersion	**Response preparedness**		
	Mechanical dispersion capability in place	[EPS-MD-001] Mechanical dispersion capability in place based on Santos contracted vessels availability	Existing MSAs with multiple vessel providers
	Response Implementation		
	Mechanical dispersion procedures in place to ensure safe and effective execution	[EPS-MD-002] Mechanical Dispersion to be conducted as per the Mechanical Dispersion Plan.	Mechanical Dispersion Plan; IAP; Incident Log
	Operational NEBA to determine net environmental benefit	[EPS-MD-003] Operational NEBA confirms suitability and environmental benefit.	Incident Log; IAP

12. Chemical dispersant application plan

Table 12-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 12-1: Chemical dispersant – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities	
Initiation criteria	Notification of a Level 2/3 condensate spills	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✗	✓2
Termination criteria	• Application of chemical dispersants will cease when dispersant efficacy is no longer providing a net environmental benefit as assessed through the NEBA process, and • Agreement is reached with Jurisdictional Authorities to terminate the response	

12.1 Overview

Dispersants are chemicals that are sprayed onto floating oil slicks by vessels and/or aircraft. Dispersants are designed to separate the oil into small droplets and assist with dispersion in the water column to speed up the process of natural biodegradation. Chemical dispersants can be used to:

- decrease the concentration and volume of surface oil reaching sensitive receptors
- increase the rate of natural biodegradation
- reduce the quantity of waste created.

The operational NEBA process will consider potential impacts of both oil and dispersant on sensitive receptors, taking into account information gained from monitor and evaluate activities. This will inform decisions on dispersant use throughout the response, including application location(s), the volumes and rates at which dispersant is applied, and when to limit or cease dispersant use.

Surface application of dispersants is considered to be a secondary response strategy for Van Gogh crude (refer to Section 6.4). Modelling did not predict surface oiling ≥50 g/m^2 (the minimum surface thickness required for effective dispersant application). However, the response strategy is retained in the unlikely event that areas ≥50 g/m^2 are observed in the event of a spill.

12.1.1 Surface chemical dispersants

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50 to 100 g/m² on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. This includes BAOACs 1 to 3 (EMSA, 2010) (Table 12-2). IPIECA (2015a) recommends that the thickest areas of oil should be targeted for effective surface dispersant application.

12.1.2 Dispersant application area

The base case for surface dispersant application is that no application is to occur:

- within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application permitted in the Multiple Use Zone)
- within State Marine Parks
- within State Waters
- within 10 km of water depths <10 m LAT
- within exclusion zones of offshore facilities

Table 12-2: Bonn Agreement oil agreement appearance codes

Code	Description	Layer Thickness (µm)	Litres per km^2
1	Silvery sheen	0.04 to 0.30	40 to 300

Code	Description	Layer Thickness (µm)	Litres per km^2
2	Rainbow sheen	0.30 to 5.00	300 to 5,000
3	Metallic	5 to 50	5,000 to 50,000
4	Discontinuous true oil colour	50 to 200	50,000 to 200,000
5	Continuous true oil colour	More than 200	More than 200,000

12.2 Vessel-based dispersant operations

For the purposes of resource planning for the Ningaloo Vision CoPFAR activities, it has been assumed that only one vessel dispersant system may be tasked (if at all), given modelling did not predict surface oiling ≥50 g/m^2 (the minimum surface thickness required for effective dispersant application) (refer to Section 6.3.1).

Table 12-3 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this tactic. Table 12-4 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial vessel dispersant operations are listed in Table 12-5. The OSC and/or Incident Commander is ultimately responsible for the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 12-3: Implementation guidance – vessel dispersant application

Action		Consideration	Responsibility	Complete
Initial actions	Confirm operational NEBA supports surface chemical dispersant application.	Oil type suits dispersant application. Surveillance to confirm oil spill thickness supports use of dispersants from vessels (e.g. BAOAC 4 to 5). Liaise with third party providers (e.g. AMOSC) as part of operational NEBA. Evaluate oil spill trajectory modelling when available. Guidance is provided as per AMSA guideline: Obtaining approval to use an oil spill control agent at sea or on a shoreline (AMSA, 2022).	Planning Section Chief Environment Unit Leader	☐
	For dispersant use in State waters – seek approval from DoT. If dispersant use in Commonwealth waters could impact State waters, notify DoT.	Approval is required from the HMA/SMPC if dispersant is to be used in State waters – refer to Section 4.6.2. The DoT SMPC requests early notification if use of dispersant in Commonwealth waters could impact State waters – refer to Section 4.6.2.	Planning Section Chief	☐
	Activate Joint Industry OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment via the OSM Services Provider (Refer to North West Shelf OSM-BIP (7715-650-ERP-0002), Section 12)	Initiation criteria for OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment is as follows: • Application of dispersant has been selected as a response option. Therefore, this OMP requires immediate activation via the North West Shelf OSM-BIP (7715-650-ERP-0002), Section 12) Note that the 'shake test' assessment does not form part of OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment and is usually performed as an initial assessment of dispersant efficacy.	Planning Section Chief Environment Unit Leader	☐
	Source vessel/s for dispersant application and mobilise to nearest port for loading equipment and personnel (Exmouth or Dampier).	Vessel specification for dispersant vessels provided in ER Intranet – First Strike Resources, and within Santos Vessel Requirements for Oil Spill Response document (7710-650-ERP-0001).	Logistics Section Chief	☐
	Mobilise dispersant operations Team Leaders and Team Members (Santos Core Group and/or AMOSC staff/ Industry Core Group) to designated port.	Each vessel undertaking dispersant application (is to be manned with personnel trained in dispersant application (e.g. AMOSC staff, Santos or Industry Core Group member) who is the Team Leader tasked with controlling the operations and implementing in a safe and responsible method. For prolonged dispersant operations, OSRL responders via Singapore may also be used.	Logistics Section Chief	☐
	Mobilise vessel-based dispersant application equipment and dispersant shake test kits from the Santos storage location in Exmouth (Exmouth Freight & Logistics) to the designated deployment port.	Exmouth Freight & Logistics to assist with local logistics and vessel loading of vessel spray systems and dispersant movement in Exmouth.	Logistics Section Chief	☐
	Use aerial surveillance to determine priority areas for dispersant application an define operational area for response.	Aerial surveillance reports of oil location and thickness.	Planning Section Chief Operations Section Chief	☐

Action		Consideration	Responsibility	Complete
	Mobilise AMOSC (Exmouth)/ AMSA (Karratha) dispersant stock to nominated vessel deployment location Exmouth and/or Dampier ports.	Check up to date dispersant stockpile inventories can be accessed via ER Intranet – First Strike Resources.	Logistics Section Chief	
	Use aerial surveillance to determine priority areas for dispersant application an define operational area for response.	Aerial surveillance reports of oil location and thickness.	Planning Section Chief Operations Section Chief	
	Identify safety requirements and controls associated with spraying dispersants and working over oil.	-	Safety Officer	☐
	Ensure shake jar test is conducted in-field to determine likely effectiveness of dispersant application and report results to IMT	Refer to NP-GUI-013: National Plan oil spill dispersant effectiveness field test kit operational guide, for guidance on how to conduct a dispersant field test.	Operations Section Chief	☐
	First vessel onsite test spray oil – confirm effectiveness.	Effectiveness to be recorded with photos.	Operations Section Chief	☐
	Confirm operational NEBA supports surface chemical dispersant application.	Use forecast modelling, monitor and evaluate data and dispersant efficacy results in operational NEBA.	Operations Section Chief	☐
	If dispersant application is shown to be effective and approved for ongoing use by the Incident Commander, continue vessel operations and defining operational area.	Use real-time or most recent visual surveillance observation data to develop operational zones for vessel dispersant operations. The base case restrictions for dispersant application are – no application: • Within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application considered in the Multiple Use Zone) • Within State Marine Parks • Within State Waters • Within 10 km of water depths <10 m LAT • Within exclusion zones of offshore facilities The above applies unless justified otherwise by the Operational NEBA, noting that no application in Australian Marine Park (outside multi-use zone) or State waters without relevant authority approval (refer to Section 4.6.2 for the process on obtaining consent for dispersant use in WA State waters and on notification to the DoT HMA/SMPC of use in adjacent Commonwealth waters).	Operations Section Chief Incident Commander Environment Unit Leader Planning Section Chief	☐
	Monitor for efficacy using the SMART Protocol (Section 12.5) as described in OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment and provide results to the IMT.	Initial monitoring is likely to only include Tier I (visual monitoring) of the SMART Protocol. Observers trained in visual observation techniques should be used.	Operations Section Chief	☐
Ongoing Actions	Reassess dispersant use, utilising the NEBA process for each operational period. Cease application if no net environmental benefit.	-	Operations Section Chief	☐

Action		Consideration	Responsibility	Complete
	Continue to mobilise additional chemical dispersant stocks from AMOSC and AMSA.	-	Logistics Section Chief	☐
	Maintain operational zones and provide updates to Vessel Masters on most suitable locations for application.	-	Operations Section Chief	☐

Table 12-4: Vessel Dispersant application – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Santos Vessel Dispersant Spray Systems	Santos owned	2 x containers (each c/w 3 x spray systems – dual arm, single arm & Afedo head)	Exmouth (Exmouth Freight & Logistics)	Mobilised to port within 12 hours of IMT request for dispersant resources
AMOSC Vessel Dispersant Spray System	AMOSC	1) Afedo Spray systems 2) Viko Spray 3) Dispersant Spray Boom vane 4) Global Boat spray system	1) Broome – 2; Exmouth – 1; Fremantle – 5; Geelong – 4 2) Exmouth – 1; Geelong – 2; Fremantle - 1 3) Fremantle – 1; Geelong – 1 4) Fremantle – 1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; for equipment mobilisation timeframes refer to Table 10-12
AMSA Vessel Dispersant Spray System	AMSA	Ayles Fernie Boat Spray	Darwin – 2; Karratha – 2; Fremantle – 2	Access to National Plan equipment[20] through AMOSC[21]. Equipment mobilisation times vary according to stockpile location.
Dispersant	AMOSC	Refer to Table 12-9		Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; for equipment mobilisation timeframes refer to Table 10-12
	AMSA	Refer to Table 12-9		Access to National Plan equipment through AMOSC. Equipment mobilisation times vary according to stockpile location.

[20] Updated AMSA Equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations (NEMO) Portal - https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations

[21] Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Dispersant spray system vessels	Santos contracted vessel providers Preference for vessels used in Santos deployment exercises	Varies – check through vessel contractors/ Santos vessel tracking system	Exmouth, Dampier, NW locations	Varies subject to location/ availability
Personnel (field responders)	AMOSC staff	12	Fremantle – 7 Geelong – 5	Response via duty officer within 15 minutes of first call; timeframe for availability of AMOSC personnel dependent on location of spill and transport to site
	AMOSC Core Group (Santos)	16	Perth/NW Aus. facilities – 14 Port Bonython (South Aus.) – 2	12+ hours <48 hours to WA
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility location across Australia	Location dependent; confirmed at time of activation

Table 12-5: Vessel based dispersant application – first strike response timeline

Task	Time from IMT call-out
IMT confirms applicability of strategy and begins sourcing vessel dispersant resources for applicable spills	<3 hours
Suitable Dispersant Vessels mobilised to nearest deployment port (Dampier)	<12 hours
Santos Offshore Core Group mobilised to deployment port (Dampier)	<12 hours
Vessel spray system equipment mobilised to deployment port	<12 hours
Dispersants mobilised to port	<12 hours
Vessel spray operation commenced at spill site (weather/daylight dependent)	<36 hours (weather/daylight dependent)
Minimum Resource Requirements	
• Suitable dispersant application vessel – refer Santos Offshore ER Intranet and Santos Vessel Requirements for Oil Spill Response [7710-650-ERP-0001] for vessel specification • One vessel dispersant spray system • Dispersant (10 m³) • Two Santos Core Group or Industry Core Group responders • Personal protective equipment	

12.3 Aerial dispersant operations

For the purposes of resource planning for the Ningaloo Vision CoPFAR activity, it has been assumed that only 1 aerial dispersant spray system from AMOSC may be tasked (if at all), given modelling did not predict surface oiling ≥50 g/m^2 (the minimum surface thickness required for effective dispersant application) (refer to Section 6.3).

Table 12-6 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 12-7 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial aerial dispersant operations are listed in Table 12-8. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 12-6: Implementation guidance – aerial dispersant application

Action		Consideration	Responsibility	Complete
Initial actions	Confirm operational NEBA supports surface chemical dispersant application.	Oil type suits dispersant application. Surveillance to confirm oil spill thickness supports use of dispersants from vessels (e.g. BAOAC 4 to 5). Liaise with third party providers (e.g. AMOSC) as part of operational NEBA. Evaluate oil spill trajectory modelling when available. Guidance is provided as per AMSA guideline: Obtaining approval to use an oil spill control agent at sea or on a shoreline (AMSA, 2022).	Planning Section Chief Environment Unit Leader	☐
	For dispersant use in State waters – seek approval from DoT. If dispersant use in Commonwealth waters could impact State waters, notify DoT.	Approval is required from the HMA/SMPC if dispersant is to be used in State waters – refer to Section 4.6.2.1. The DoT SMPC requests early notification if use of dispersant in Commonwealth waters could impact State waters – refer to Section 4.6.2.1.	Planning Section Chief	☐
	Activate Joint Industry OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment via the OSM Services Provider (Refer to North West Shelf OSM-BIP (7715-650-ERP-0002), Section 12)	Initiation criteria for OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment is as follows: • Application of dispersant has been selected as a response option. Therefore, this OMP requires immediate activation via the North West Shelf OSM-BIP (7715-650-ERP-0002), Section 12. Note that the 'shake test' assessment does not form part of OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment and is usually performed as an initial assessment of dispersant efficacy.	Planning Section Chief Environment Unit Leader	☐
	Mobilise initial resources for aerial application. After initial AMOSC notifications are complete, contact AMOSC Duty Officer and confirm requirements for the following resources: Access to and mobilisation of required AMOSC dispersant stocks and associated equipment into designated airstrip (AMOSC will arrange through their contracted transport provider). Activation of the Fixed Wing Aerial Dispersant Capability (FWADC) (AMOSC will activate this on behalf of Santos). Provision of trained spill responders to support operations (AMOSC Staff and Core Group).	Refer Joint Standard Operating Procedures for FWADC. AMOSC will deploy appropriate aircraft to a designated airstrip close to the spill location (e.g. Dampier, Port Hedland, Learmonth Airports), and arrange for air tractor pilots and Air-Attack Supervisor as per AMOSC FWADOps Plan (AMOSC, 2022).	Logistics Section Chief Operations Section Chief Aviation Superintendent	☐
	Finalise Fixed Wing Air Operations Plan and Air Operations Plan in consultation with	Ensure flight schedule in Air Operations Plan considers requirements for other activities such as aerial surveillance sorties.	Operations Section Chief	☐

Action		Consideration	Responsibility	Complete
	AMOSC, AMSA, Aerotech First Response and other stakeholders.		Aviation Superintendent Planning Section Chief	
	Using real-time or most recent visual surveillance observation data, develop operational zones for aerial dispersant operations.	Focus on applying dispersant to areas of slick that threaten priority receptors and are of a sufficient thickness whereby chemical dispersants will be effective. The base case restrictions for dispersant application are – no application: • within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application considered in the Multiple Use Zone) • within State Marine Parks • within State Waters • within 10 km of water depths <10 m LAT • within exclusion zones of offshore facilities The above applies unless justified otherwise by the Operational NEBA, noting that no application in Australian Marine Park (outside Multi-use zone) or State waters without relevant authority approval (refer to Section 4.6.2.1. for the process on obtaining consent for dispersant use in WA State waters and on notification to the DoT HMA/SMPC of use in adjacent Commonwealth waters).	Operations Section Chief Planning Section Chief	☐
	Ensure shake jar test is conducted in-field to determine likely effectiveness of dispersant application and report results to IMT	Refer to NP-GUI-013: National Plan oil spill dispersant effectiveness field test kit operational guide, for guidance on how to conduct a dispersant field test.	Operations Section Chief	☐
	Dependent upon the results of the shake jar test, aircraft are deployed to conduct a test spray (if vessel-based test is unavailable). Monitor for efficacy using the SMART Protocol (Section 12.5), as described in OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment, and provide results to the IMT.	Initial monitoring is likely to only include Tier I (visual monitoring) of the SMART Protocol. Observers trained in visual observation techniques should be used.	Operations Section Chief	☐
	Conduct aerial dispersant spraying reporting effectiveness to IMT.	-	Operations Section Chief Planning Section Chief	☐
Ongoing Actions	Conduct operational NEBA during each operational period to reassess effectiveness of application rates and dispersant efficacy.	-	Environment Unit Leader Planning Section Chief	☐

Action		Consideration	Responsibility	Complete
	Maintain operational zones and provide updates to pilots on most suitable locations for aerial application.	-	Operations Section Chief Planning Section Chief	☐

Table 12-7: Aerial chemical dispersants application – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Aerotech First Response (AFR) fixed wing aircraft, pilots and ground crew	AMOSC – Fixed Wing Aerial Dispersant Contract	Four under FWADC contract Additional aircraft potentially available through Aerotech First Response	Operations from designated airbase Aircraft initially mobilised from 4 bases around Australia: • Jandakot (WA) • Batchelor (NT) • Parafield (SA) • Scone (NSW)	4 x air tractor contractors to have wheels up in four hours from locations around Australia. Mobilisation times depend on the flight time from the location of the aircraft Supporting equipment mobilisation (dispersants etc) as per equip mob timeframes (Table 10-12)
Hercules C130 aircraft	OSRL	One plane	Senai, Malaysia	Wheels up in six hours Available at Learmonth or Karratha within 18.5 hrs (including one technical stop at Darwin)
Air Attack / Aerial Observation Aircraft	Santos contracted helicopter provider/s + contracted fixed wing	Two (contracted) + additional subject to availability	Karratha (primary base), Learmonth, Onslow	Wheels up within one hour for Emergency Response
Dispersant	AMOSC	Refer to Table 12-9		Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; for equipment mobilisation timeframes refer to Table 10-12
	AMSA			Access to National Plan equipment[22] through AMOSC[23]. Equipment mobilisation times vary according to stockpile location
FWADC operational personnel incl. Air Attack Supervisor and Dispersant Operations Coordinator	AMOSC and subcontractors via Fixed Wing Aerial Dispersant Contract	AMOSC staff + contractors, as per AMOSC FWADOps Plan (AMOSC, 2022).	AMOSC Fremantle AMOSC Geelong	Response via duty officer within 15 minutes of first call; timeframe for availability of AMOSC personnel dependent on location of spill and transport to site
SAR vessel (can be double use vessel)	Santos contracted vessel providers.	Varies – check through vessel contractors/ Santos vessel tracking system	Exmouth, Dampier, NW locations	Varies subject to location/ availability

Table 12-8: Aerial dispersant operations – first strike response timeline

Task	Time from IMT call-out
IMT confirms applicability of strategy and activates Fixed Wing Aerial Dispersant Capability (FWADC)	<3 hours
AMOSC to mobilise Fixed Wing aircraft to nominated airbase	<12 hours

[22] Updated AMSA Equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations (NEMO) Portal - https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations

[23] Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Task	Time from IMT call-out
AMOSC to mobilise dispersants to nominated airbase	<24 hours
AMOSC to mobilise all FWADC capability personnel to nominated airbase	<48 hours
AMOSC/Santos to mobilise air attack / aerial observation aircraft to nominated airbase to support air attack surveillance	<48 hours
AMOSC/Santos to mobilise vessel to nominated port to provide SAR support	<48 hours
First FWADC test spray	<48 hours (weather/daylight dependent)

Minimum Resource Requirements

- one fixed wing aircraft (Aerotech First Response)
- one helicopter
- SAR Vessel
- WA AMOSC dispersant stocks to deployment airbase
- AMOSC contracted FWADC capability personnel:
  - Pilots
  - Air Attack Supervisor
  - Aerial Observer
  - FOB Commander
  - Airbase Manager
  - Safety Officer
  - Dispersant Operations Coordinator
  - Dispersant Loading Crew
  - Log/ Admin

12.4 Dispersant selection process

12.4.1 Dispersant use

Dispersants should only be used when the risks associated with their use to the environment as a whole have been analysed, and it has been determined that there would be a net environmental benefit from their use. The type of dispersant that will be effective is influenced by the oil type and metocean conditions (Hook and Lee, 2015).

Most of the knowledge on the biological impacts of dispersants has been developed via laboratory experiments (Quigg et al., 2021) rather than from in-situ use. This is also the case for those dispersants listed as approved in the National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents (OSCA). Before a dispersant can be considered for use by AMSA, its toxicological impact must be tested on a diverse range of aquatic taxa, including algae, invertebrates and fish (Hook and Lee, 2015). This screening process ensures that these compounds have comparatively low toxicity (according to US Environmental Protection Agency criteria; Hemmer et al., 2011) and that they are much less toxic than oil (Hook and Lee, 2015).

Although surface dispersants have been used as an oil spill response technique for multiple spills across the globe since the 1970s, there remains a paucity of information about the long-term consequences of dispersant use in the marine environment (Quigg et al., 2021). However, the available research has found no compelling evidence that at low to moderate oil concentrations that chemically dispersed oil was any more toxic than oil alone (NASEM, 2020). However, at high concentrations the combination of oil and dispersant appeared more toxic (Quigg et al., 2021), suggesting caution should be applied when considering dispersant application rates and volumes. This also shows the importance of ongoing dispersant effectiveness monitoring (Section 17) and its application through the operational NEBA process.

12.4.2 Dispersant selection

Chemical dispersants listed as approved in the National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents (OSCA) are to be prioritised for use. OSCA listed dispersants are readily available to Santos through AMOSC, OSRL and AMSA. These include Slickgone NS, Slickgone EW, Corexit EC9500A, Corexit 9527 (transitional acceptance) and Finasol 52. Safety data sheets for these products are available at the AMSA register of oil spill control agents, and for Corexit 9527 (which has transitional acceptance), at the manufacturer's website. There are sufficient stockpiles of these dispersants in Australia to service the entire duration of surface application, given the that floating oil at or above 50 g/m^2 is not expected.

If dispersant types additional to those on the Register of OSCA are required, Santos will use its Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) prior to application. FINASOL OSR 52 has been pre-assessed as low risk using the Santos Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) and are therefore designated as acceptable for use.

The Santos Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure requires the dispersant to be risk assessed and deemed environmentally acceptable. The criteria used for environmental acceptability includes aquatic toxicity, biodegradation and bioaccumulation potential data.

Where sufficient data is available, the chemical is risk assessed using the Offshore Chemical Notification Scheme (OCNS) Chemical Hazard and Risk Management (CHARM) or non-CHARM models depending on the model's applicability criteria. Chemicals that meet the selection criteria belonging to CHARM Colour-band Gold or Silver, or non-CHARM groups D or E are considered environmentally acceptable. According to the OCNS CHARM model, GOLD ranked chemicals have a maximum Hazard Quotient (HQ) of <1 and Silver, HQ ≥1 and <30. According to the OCNS non-CHARM model guidelines, the worst-case initial OCNS grouping would be group B based on aquatic toxicity data of LC50 or EC50 >1 to 10 ppm. To obtain a final OCNS grouping of D, the chemical would need to be readily biodegradable (>60% biodegradation in 28 days) and nonbioaccumulative (Log Pow <3 or BCF ≤100 and molecular weight ≥700). The best case initial OCNS grouping would be group E based on aquatic toxicity data of LC50/EC50 >1,000 ppm. The best case final OCNS grouping would remain E with the chemical readily biodegradable and non-bio accumulative.

If the chemical cannot be rated using the method described above, it would be assigned a pseudo OCNS CHARM or non-CHARM group ranking. Where there is insufficient ecotoxicity data available to either rate the chemical or assign a pseudo ranking, robust justification demonstrating its environmental acceptability shall be provided, based on volume/concentration, receiving marine environment characteristics and ecotoxicity data (aquatic toxicity, biodegradability and/or bioaccumulation data where applicable; i.e., biodegradation and bioaccumulation potential are not applicable to inorganic substances).

During a response, chemical dispersant shall be tested on the released oil at a laboratory as part of initial operational monitoring (refer Section 17) as well as through field testing using vessel-based spray systems/

dispersant shake test kits. The State ESC can also advise on the location of AMSA National Plan Dispersant Effectiveness Test Kits, which could be utilised in addition to Santos' dispersant efficacy testing resources.

12.5 Dispersant effectiveness monitoring

Santos will conduct dispersant effectiveness monitoring in accordance with the: North West Shelf OSM-BIP (7715-650-ERP-0002) and Joint Industry OSM Framework OMP: Surface chemical dispersant fate and effectiveness assessment (APPEA, 2021) (Section 17).

12.6 Surface dispersant supply and logistics requirements

A LOWC from Ningaloo Vision CoPFAR activities has a low flow rate (~8.5 L/min) and as noted in Section 0, it is predicted a slick would not achieve the minimum surface thickness required (50 g/m^2) for effective dispersant application.

However, for the purposes of a capability assessment, it has been highly conservatively assumed that the entire daily flow rate of ~12.25 m^3 would be available for treatment. Modelling (RPS, 2024) predicts the Van Gogh Crude is highly persistent with the majority of the volume remaining as surface oil irrespective of the environmental conditions. Approximately 90% of Van Gogh Crude is predicted to remain on the surface after 24 hours (approximately 11 m^3). The mass on the surface is predicted to drop to approximately 74% after 7 days, and the decrease evenly balanced between evaporation and decay. To treat this volume of surface oil at a DOR of 1:25 would require 0.44 m^3 dispersant per day, or ~40 m^3 over a spill duration of 91 days. The dispersant stockpiles available to Santos in Australia would be sufficient to supply dispersant for the duration of operations.

Dispersant stockpiles are made available via AMOSC membership or AMSA agreement with most supplies within Australia being available within 48 to 55 hours. Santos can supply all required road logistics to meet these timeframes through its contracted logistics provider. Santos can also provide air logistics for all other stockpiles throughout Australia and internationally.

Dispersant availability is checked bi-annually against Santos' worst-case requirements across all operational, project and drilling activities.

Table 12-9: Dispersant supply stock locations and volumes

Source	Stock Location	Volume (m^3)	Type	Total Volume (m^3)
AMSA	Adelaide	10	Slick Gone EW	355
		10	Slick Gone NS	
	Brisbane	10	Slick Gone EW	
		10	Slick Gone NS	
	Townsville	10	Slick Gone EW	
		15	Slick Gone NS	
	Karratha	10	Slick Gone EW	
		10	Slick Gone NS	
	Darwin	10	Slick Gone EW	
		10	Slick Gone NS	
	Devonport	10	Slick Gone EW	
		10	Slick Gone NS	
	Fremantle	48	Slick Gone NS	
		52	Slick Gone EW	
	Horne Island	10	Slick Gone NS	
	Melbourne	10	Slick Gone EW	
		10	Slick Gone NS	
	Sydney	45	Slick Gone NS	
		55	Slick Gone EW	
AMOSC	Exmouth	75	Slick Gone NS	511

Source	Stock Location	Volume (m^3)	Type	Total Volume (m^3)
	Fremantle (Welshpool)	8	Slick Gone NS	
		27	Corexit 9500	
		50% of SFRT stockpile = 250*	Slick Gone NS	
	Geelong (Altona North)	75	Slick Gone NS	
		62	Corexit 9500	
	Broome	14	ARDROX 6120	
OSRL (Santos has access up to 50% of SLA stockpile)	Various (Singapore, UK, Bahrain, USA)	50% of SLA = 207†	Slick Gone NS Slick Gone EW Slickgone LTSW Finasol OSR 52 Corexit 9500	207
Total				1,073
OSRL Global Dispersant Stockpile (GDS)	Various (Singapore, France, South Africa, USA, Brazil)	5,000†	Slick Gone NS Finasol OSR 52 Corexit 9500 Corexit 9527	5,000
Total (including additional OSRL GDS stocks)				6,073 (surface)

* As per the AMOSPlan, there is a provision made by the SFRT Steering Committee to provide up to 250 m^3 of dispersant into a surface spill response, given certain provisions are met in the first instance by AMOSC (AMOSC, 2021).

† Latest numbers as of April 2024. The SLA Equipment Stockpile Status Report and the Global Dispersant Stockpile Status Report (available from the Response Readiness Dashboard; https://www.oilspillresponse.com/readiness-dashboard/) provides the current status of the SLA dispersant stocks.

12.7 Environmental Performance

Table 12-10 indicates the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 12-10: Environmental performance –dispersant application

Environmental performance outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities.		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Chemical Dispersant Application – surface	**Response preparedness**		
	Arrangements to enable access to dispersants, equipment and personnel	[EPS-CD-001] Maintenance of access to dispersant, application equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity as specified in Table 12-4 and Table 12-7.	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract and Global Dispersant Supply Supplementary Agreement
			TRG Arrangements
	Maintenance of MSAs with multiple vessel providers	[EPS-CD-010] Santos maintains MSAs with multiple vessel providers that could be used to source vessels for dispersant application	MSAs with multiple vessel providers
	Dispersant application vessel requirements are identified	[EPS-CD-009] Maintenance of vessel specification for dispersant application vessels	Vessel specification within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)

Environmental performance outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities.		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	Response Implementation		
	Mobilisation of first strike resources	[EPS-CD-013] First strike is mobilised in accordance with details and timings as specified in first strike response timeline tables (Vessel Based Dispersant Application - Table 12-5, Aerial Dispersant Operations - Table 12-8)	Incident log
	Process in place for dispersant selection	[EPS-CD-002] Only chemical dispersants that are listed as approved on the National Plan Oil Spill Control Agent (OSCA) list, or are evaluated as acceptable as per the Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001), are to be used	National Plan Oil Spill Control Agent (OSCA) list; Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001); Chemical Dispersant Application Plan; Incident Log
	Chemical Dispersant Application Plan	[EPS-CD-015] Santos will have access to dispersants specified in Table 12-9	Incident Log
	Operational monitoring of surface dispersant efficacy will be conducted	[EPS-CD-020] Santos will conduct surface dispersant efficacy monitoring in accordance with the North West Shelf OSM-BIP (7715-650-ERP-0002) and OMP: Surface Chemical Dispersant Fate and Effectiveness Assessment (APPEA, 2021)	Incident Log; Chemical Dispersant Application Plan
	Field testing of dispersant amenability	[EPS-CD-021] Analysis of dispersant amenability provided to IMT within 24 hours of oil delivery to laboratory	Incident Log; Dispersant Amenability Report
	Field testing of dispersant / oil samples for ecotoxicity	[EPS-CD-022] If amenable to surface dispersants, and required oil volume can be collected, oil and dispersant samples to be sent for laboratory ecotoxicity testing of oil and chemically dispersed oil	Incident Log; Dispersant Ecotoxicity Report
	Test spray for assessment of dispersant effectiveness – Aerial	[EPS-CD- 024] If dispersant application is approved by the Incident Commander for aerial application, a test spray run via the National Plan Fixed Wing Aerial Dispersant Contract will be conducted to assess dispersant effectiveness	Incident Log IAP
	Test spray for assessment of dispersant effectiveness - Vessel	[EPS-CD-011] If dispersant application is approved by the Incident Commander for vessel application, a test spray will be conducted to assess dispersant effectiveness	Incident Log IAP
	Prepare operational NEBA to determine if chemical dispersant application activities are likely to result in a net environmental benefit	[EPS-CD-016] Records indicate operational NEBA completed prior to chemical dispersant activities commencing. Operational NEBA to be undertaken each operational period and included in development of following period Incident Action Plan. NEBA will consider the following information:	Incident Log IAP

Environmental performance outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities.		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
		• forecast spill modelling of oil comparing simulations with and without effect of chemical dispersants • laboratory dispersant efficacy testing results • Monitor and evaluate and operational monitoring results showing distribution of floating, stranded oil and location of sensitive fauna and habitats • operational water quality monitoring results showing distribution and concentration of subsea oil (once available) • scientific monitoring water quality sampling results (once available) • consultation with Control Agency and/or key stakeholders	
	Dispersant application area to be defined to minimise impacts to sensitive areas	[EPS-CD-018] Surface Dispersant Application Area will be defined as part of the IAP. The base case for dispersant application is that no dispersants to be applied: • within 10 km of water depths <10m LAT • within exclusion zones of offshore facilities • within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application considered in the Multiple Use Zone) • within State Marine Parks within State Waters	IAP
	Dispersant application to target thick oil to maximise efficacy and minimise over application	[EPS-CD-019] Surface dispersant will only be applied in the Dispersant Application Area and target oil above BAOAC 4 and 5	Operational monitoring reports; Incident Log; IAP

13. Offshore containment and recovery plan

Table 13-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 13-1: Containment and recovery – environmental performance outcome, initiation criteria and termination criteria

Environmental Performance Outcome	Implement containment and recovery tactics to reduce the volume of surface hydrocarbons to reduce contact with protection priorities	
Initiation criteria	• Level 2 or Level 3 spills from a LOWC event • NEBA confirms the response strategy is beneficial	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✗	✓2
Termination criteria	• NEBA is no longer being achieved, or • Agreement is reached with Jurisdictional Authorities to terminate the response strategy	

13.1 Overview

Containment and recovery involves using booms and skimming equipment to create physical barriers on the water surface to contain and recover the oil, to remove risk of oil contacting environmental, social and cultural sensitivities. This strategy is often used in the offshore environment in close proximity to the hydrocarbon source. Once contained, an attempt to recover the hydrocarbons from the surface waters can be undertaken.

Stochastic results from oil spill modelling predicts that there is no probability of floating oil exceeding 50 g/m^2 for the LOWC scenario. Containment and recovery is therefore a secondary response strategy in case there are areas observed at suitable thickness in the event of a LOWC event as deemed beneficial to contain and recover by the operational NEBA. This strategy is not considered applicable for MDO spills given that MDO evaporates and spreads quickly to a thin film, making recovery via skimmers difficult and ineffective.

Table 13-2 provides applicability criteria on when containment and recovery may be a suitable response option.

Table 13-2 Containment and recovery application criteria

Criteria	Recommended	Not Recommended
Spill characteristics	• Patchy slick • Extended operations • Surface concentrations >50 g/m² (BAOAC of 4) at a minimum, 100 g/m² (BAOAC of 5) is optimal	• Situation dependent • Surface thickness <50 g/m² (BOAC <4)
Hydrocarbon type	• Group 3 hydrocarbons and above • Persistent components of Group 1 and 2 hydrocarbons may be suitable	• Minor to moderate spills of Group 1 and 2 hydrocarbons are likely to weather rapidly. High volatiles of these hydrocarbons may be a safety risk to personnel
Operating environment	• Waves <1 m for nearshore containment and recovery systems (Santos containment and recovery boom) • Waves <1.8 m for offshore systems • Winds <20 knots	• Wave heights exceed 1.8 m • Current >0.75 knots

13.2 Implementation guidance

For the purposes of resource planning for the Ningaloo Vision CoPFAR activities, it has been assumed that only one or two containment and recovery systems may be tasked (if at all), given that oil spill modelling does not predict any surface oil reaching a thickness of 50 g/m^2 (refer to Section 6.3.1).

For planning purposes, a J-Sweep configuration (Figure 13-1) using two vessels; one deployment vessel and one towing vessel, is assumed for each containment and recovery unit. The resources available to carry out containment and recovery operations are detailed in Table 13-4. Considering the requirement of one 200 m offshore boom, one offshore skimmer and temporary storage (typically achieved using one 25 m^3 towable storage

barge and two 4 m^3 offshore rated ISO tanks) for each containment and recovery unit, Santos has access to sufficient resources through the existing arrangements with AMOSC and AMSA.

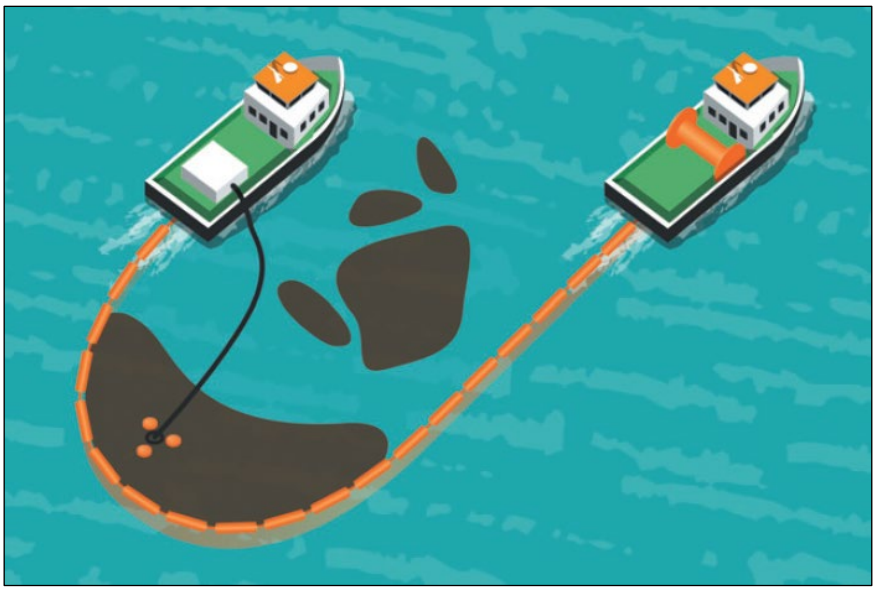

Figure 13-1: 'J' Configuration for Containment and Recovery Operations

Source: IPIECA (2016b)

Table 13-3 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 13-4 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial containment and recovery operations are listed in Table 13-5. The Incident Commander is ultimately responsible for the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 13-3: Implementation guidance – containment and recovery

Action		Consideration	Responsibility	Complete
Initial Actions	**Containment and recovery**			
	Identify and activate containment and recovery equipment stockpiles. Initial equipment mobilisation from Varanus Island and/or Exmouth.	Initial deployment from Karratha or Exmouth pending vessel availability. Up to date stockpile information accessed through Santos' Emergency Response Intranet Site.	Logistics Section Chief Supply Unit Leader Operations Section Chief	☐
	Identify suitable deployment vessels/crew. Mobilise resources to port location (Varanus Island and/or Exmouth).	Refer to Table 13-4 for location of containment and recovery resources. Initial deployment from Karratha or Exmouth pending vessel availability. Preference will be for vessels and crew that are exercised in regular Santos booming exercises.	Logistics Section Chief Supply Unit Leader Operations Section Chief	☐
	Assess the spill trajectory modelling and other monitor and evaluate data to identify operational area for containment and recovery deployments.	Refer to Table 13-2 for guidance.	Operations Section Chief Planning Section Chief	☐
	Confirm conditions are suitable for containment and recovery activities.	Refer to Table 13-2 for guidance.	Operations Section Chief Planning Section Chief	☐
	Mobilise deployment personnel to nominated marine base(s).	Each vessel conducting containment and recovery is to be manned with a trained AMOSC, Santos or OSRL Oil Spill Responder who is the Team Leader tasked with controlling the operations and implementing them in a safe and responsible method. The Team Leader has the responsibility of evaluating the effectiveness of the containment and recovery operations and communicating the information to the IMT Operations Section Chief.	Operations Section Chief Logistics Section Chief	☐
	Coordinate aerial surveillance support to vessels to ensure they are being directed to priority locations for containment and recovery activities within operational zones.	Focus on containment and recovery activities to areas of slick of a sufficient thickness whereby containment and recovery activities will be effective. Refer to Table 13-2 for guidance.	Planning Section Chief Operations Section Chief	☐
	Direct containment and recovery operations to designated operational zones.	The base case restrictions for containment and recovery is no operations within 25 km of well site.	Operations Section Chief	☐
	Decanting (if selected)			
	Obtain decanting approval from AMSA (Commonwealth waters) or DoT (WA waters).	Under both MARPOL and *Pollution of Waters by Oils and Noxious Substances Act 1987* (WA; POWBONS), decanting must be approved by the relevant Jurisdictional Authority where the discharge will occur.	Environment Unit Leader	☐

Action		Consideration	Responsibility	Complete
		Approval should be sought to discharge water that has separated from oil into the apex of the already deployed containment boom system (with operational skimmer). This will increase the oil storing capacity of storage tanks.		
	Ensure personnel onboard the vessels are familiar with the decanting procedure approved by the relevant authority AMSA (Commonwealth waters) or DoT (WA waters).	-	Operations Section Chief	☐
	Commence decanting operations, ensuring that any discharged water is directed into the apex of the already deployed containment boom system (with operational skimmer).	-	Vessel Master/s	☐
	Ensure there is sufficient temporary storage for oily wastewater onboard vessel.	-	Operations Team Leader	☐
Ongoing Actions	**Containment and recovery**			
	Coordinate the dispatch of operationally ready (all equipment and personnel on board) vessels via the IAP.	Equipment will be maintained and replaced as necessary through existing stockpiles.	Operations Section Chief	☐
	Maintain operational zones and provide updates to Vessel Master/s on most suitable locations for containment and recovery operations.	Continue to utilise aerial surveillance data to inform the location of operational zones.	Operations Section Chief	☐
	Develop waste transfer process to secondary vessels/barge to enhance containment and recovery vessel operational time, reduce port visits for waste unloading and reduce contamination.	Consider location and size/ type of waste collection vessel/barge and suitability of equipment and waste receptacles for dynamic lifts. Note approval requirements (by DoT) for use of Exmouth boat harbour for berthing of oiled vessels and/or oil transfer (refer to Table 18-2). If possible, consider waste transfer to Dampier port rather than Exmouth which is a small multi-use port facility.	Operations Section Chief Planning Section Chief Logistics Section Chief	☐
	Decanting (if selected)			
	Record volumes of all water decanted.	This information must be supplied to the relevant jurisdictional authority.	Vessel Master/s	☐
	Manage any solid wastes generated.	-	Vessel Master/s	☐

Table 13-4: Containment and recovery – resource capability

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
Recovery booms and skimmers	Santos	Containment and recovery boom (Current Buster 4 / Expandi Boom) Comes with accessories and powerpacks Total – 4	Exmouth container – 2 x Expandi boom systems and accessories Varanus Island container – 1 x Expandi boom system and accessories, 1 x Current Buster 4 boom system and accessories	Within 24 hours (for Exmouth or Varanus Island based deployment)
		Desmi DBD16 brush skimmer For inshore/calm seas deployment Comes with hoses/powerpacks Total – 2	Exmouth – 1 Varanus Island – 1	Within 24 hours (for Exmouth or Varanus Island based deployment)
	AMOSC	Desmi Ro-boom 1500 - 200 m offshore boom on hydraulic reel Total – 18	Exmouth – 2 Fremantle – 6 Geelong - 10	Response via Duty Officer within 15 minutes of first call – AMOSC personnel available within 1 hour of initial activation call. Equipment mobilisation times vary according to stockpile location (refer to Table 10-12).
		NOFI Current buster 2 boom system Total – 1	Geelong – 1	
		Desmi Speed sweep boom system Total – 1	Geelong – 1	
		Skimmers – refer to Table 14-3		
	AMSA	RO boom (200 m) Total – 8	Karratha – 4 Fremantle – 4	Access to National Plan equipment[24] through AMOSC[25]. Equipment mobilisation times vary according to stockpile location
		Vikoma Hi Sprint boom Total – 4	Karratha – 2 Fremantle – 2	
		LWS 500 weir skimmer Total – 8	Fremantle – 4 Karratha – 4	
		Desmi termite skimmer Total – 2	Fremantle – 1 Karratha – 1	

[24] Updated AMSA Equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations (NEMO) Portal - https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations

[25] Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
	Industry Mutual Aid equipment	Offshore boom and skimmers	WA	Access to Industry Mutual Aid through AMOSPlan and facilitated by AMOSC
	OSRL (Guaranteed access to 50% by type of equipment available. Additional access considered on a case-by-case basis)	37 x RO boom (200 m)	Various – Singapore, UK, Bahrain, Fort Lauderdale	Response via Duty Officer within 10 minutes of first call. Equipment mobilisation times vary according to stockpile location.
		2 x Hi Sprint boom (300 m)		
		15 x Towing boom (Current Busters)		
		50 x Offshore recovery skimmers		
Offshore waste storage	AMOSC	Lancer barges (25 m^3 each) Total – 4	Fremantle –2 Geelong – 2	Response via Duty Officer within 15 minutes of first call – AMOSC personnel available within 1 hour of initial activation call. Equipment mobilisation times vary according to stockpile location (refer to Table 10-12).
		Deck bladders (25 m^3 each) Total – 6	Fremantle –3 Geelong – 3	
	AMSA	8 x Vikoma flexidam (10 m^3 each) Total – 8	Fremantle –4 Karratha –4	Access to National Plan equipment through AMOSC. Equipment mobilisation times vary according to stockpile location.
		5 x Canflex sea slug (10 m^3 each) Total – 5	Fremantle –3 Karratha – 2	
		4 x Vikoma frost barge (25 m^3 each) Total – 4	Fremantle –2 Karratha – 2	
		2 x Covertex tow tank (20 m^3 each) Total – 2	Karratha – 2	
	Via Waste Service Provider Contract	Refer to Waste Management (Section 18) for details on Santos' waste service provider	Perth Karratha	<24 hours
	Santos OEG Contract	Liquid waste ISO tanks (4 m^3)	WA	<24 hours. Offshore rated ISO tanks are readily available through existing contract arrangements through OEG.
	OSRL (Guaranteed access to 50% by type of equipment available.	14 x Storage barges (50 m^3 each)	Various – Singapore, UK, Bahrain, Fort Lauderdale	Response via Duty Officer within 10 minutes of first call. Equipment mobilisation times vary according to stockpile location.
		21 x Storage barges (25 m^3 each)		
		9 x Waste containment tanks (10 m^3 each)		
		2 x Sea slug (10 m^3 each)		

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
	Additional access considered on a case-by-case basis)			
Offshore containment and recovery deployment vessels, towing vessels and vessel crew Waste transfer vessels/barges for waste oil storage and transfer	Santos contracted vessel providers. Preference for vessels used in Santos deployment exercises	Varies – check through vessel contractors / Santos vessel tracking system. Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) provides the required vessel specifications.	Exmouth, Dampier, NW locations, Singapore	Varies subject to location / availability
Personnel (field responders) for OSR strategies	AMOSC Staff	12	Fremantle – 5 Geelong – 7	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site.
	AMOSC Core Group (Santos)	16	Perth / NW Australian facilities – 14	From <24 hours (NW-based personnel) From <48 hours (Perth personnel)
			Port Bonython (SA) – 2	<48 hours to WA locations
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility locations across Australia	Location dependent. Confirmed at time of activation.

Table 13-5: Containment and recovery – first strike response timeline

Task	Time from IMT call-out
IMT confirms applicability of strategy and begins sourcing containment and recovery resources for applicable spills	<4 hours
Santos Offshore Core Group members mobilised to deployment port	<24 hours
Containment and recovery equipment (offshore booms/skimmers) mobilised to deployment port	<24 hours
Waste storage equipment mobilised to port	<24 hours
Suitable containment and recovery vessels mobilised to port	<24 hours
Containment and recovery trained personnel mobilised to deployment port	24 – 48 hours
Containment and recovery operation deployed to spill site (weather/daylight dependent)	<48 hours (weather/daylight dependent)*
Minimum Resources per Containment and Recovery Unit	
• Two suitable containment and recovery vessels (one deployment vessel + one tow vessel) – refer Santos Vessel Requirements for Oil Spill Response document (7710-650-ERP-0001) for vessel specifications • 200 m of offshore boom • 1 x offshore skimmer appropriate to hydrocarbon type and operating conditions • Waste storage (comprising a combination of towable bladders, IBCs, ISO tanks, inbuilt vessel storage tanks or a combination allowing for 33+ m^3 liquid waste volume storage per containment and recovery unit. • Personnel: – 2 x vessel masters (deployment vessel and tow vessel) – 1 x trained supervisor – 4 x deployment crew • Personal protective equipment	

* Assumes a 3.5 hour transit time to spill location by containment and recovery vessels departing Exmouth (68 km at 10 knots) and that weather/daylight allows operation to commence.

13.3 Decanting

Decanting is an important tool needed to make efficient use of waste management resources which are often a limiting factor in containment and recovery operations. The reduction of overall waste in some circumstances can create an environmental benefit which outweighs the minimal impact caused by the release of water with very low concentrations of oil.

The *Pollution of Waters by Oils and Noxious Substances (POWBONS) Act 1987* (WA) Section 8 allows for decanting for combating specific pollution incidents. Additionally, Annex 1 of MARPOL (Regulation 9) allows for decanting for combating specific pollution events to minimise the damage from pollution. Under both MARPOL and POWBONS decanting must be approved by the relevant Jurisdictional Authority. In WA State waters this is DoT (as the Hazard Management Agency under the *Emergency Management Act* 2005) and in Commonwealth waters this is AMSA. Approval will be sought if decanting is required.

If decanting approval is not obtained through AMSA/DoT, the complete collected oil and water will remain in the collection tanks and will be treated as waste. In this event, the duration of containment and recovery operations may be reduced due to restricted available sullage.

13.4 Environmental performance

Table 13-6 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 13-6: Environmental performance – containment and recovery

Environmental Performance Outcome	Implement containment and recovery tactics to reduce hydrocarbon contact to surface and shoreline priority protection areas		
Response Strategy	**Control Measures**	**Performance Standards [EPS ID]**	**Measurement Criteria**
Offshore Containment and Recovery	**Response Preparedness**		
	Access to Santos containment and recovery equipment and personnel	[EPS-CR-001] Santos personnel and equipment stored and maintained / available as per Table 13-4	Santos oil spill response team database; Santos equipment register; Exercise reports
	Access to containment and recovery equipment and personnel	[EPS-CR-002] Maintenance of access to containment and recovery equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG throughout activity as specified in Table 13-4.	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
			TRG arrangements
	Offshore waste transfer concept of operations in place	[EPS-CR-004] Offshore waste transfer concept of operations to help maximise waste storage availability for containment and recovery vessels.	Waste transfer concept of operations (within Santos Vessel Requirements for Oil Spill Response [7710-650-ERP-0001]).
	Vessel capability for containment and recovery operations	[EPS-CR-006] Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	Containment and recovery vessel requirements are identified	[EPS-CR-005] Maintenance of vessel specification for offshore containment and recovery vessels and waste storage and transport vessels	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Response Implementation		
	First strike capability mobilised	[EPS-CR-007] First strike is mobilised in accordance with details and timings as specified in Table 13-5	Incident log
	Decanting to maximise waste storage whilst minimising environmental impact and adhering to State and Commonwealth legislation	[EPS-CR-008] Decanting operation not to commence until approved. Application for offshore decanting is made to AMSA (Commonwealth waters) or DoT (State waters). Decanting of collected water by returning to boom apex collection area, to maximise waste storage	Incident log
	Aerial surveillance information to direct operations to areas with greatest oil concentration	[EPS-CR-011] Aerial surveillance reports communicated to containment and recovery Team Leaders	Incident log
	Prepare operational NEBA to determine if containment and recovery activities are likely to result in a net environmental benefit	[EPS-CR-012] Records indicate operational NEBA completed prior to containment and recovery activities commencing. NEBA will consider the oil thickness and weather constraints as key factors. Operational NEBA to be undertaken each operational period.	Incident log IAP

14. Shoreline protection and deflection plan

Table 14-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 14-1: Shoreline protection and deflection – objectives, initiation criteria and termination criteria

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priority areas	
Initiation criteria	• Level 2 or Level 3 spills where shorelines with identified or potential protection priority areas will potentially be contacted • Approval has been obtained from the relevant Control Agency to initiate the response strategy	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓2	✓2
Termination criteria	• NEBA has determined that this strategy is unlikely to result in an overall benefit to the affected shoreline/s, or • Agreement is reached with Jurisdictional Authorities to terminate the response strategy	

14.1 Overview

Protection and deflection tactics are used to divert hydrocarbons away from sensitive shoreline receptors and are more effective if they are deployed ahead of spill contact. They are typically used to protect smaller, high priority sections of shoreline.

The effectiveness of this response will be dependent on spill characteristics, hydrocarbon type, and the operating environment. Deployment is subject to safety constraints such as the potential grounding of vessels.

Protection and deflection is part of an integrated nearshore/shoreline response to be managed by the relevant Control Agency. Where Santos is not the Control Agency (refer to Table 4-2), it will undertake first-strike protection and deflection activities as required. In this circumstance, the relevant Control Agency will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline protection. Santos will provide all relevant information on shoreline character and oiling collected as part of surveillance activities carried out under its control (refer North West Shelf OSM-BIP (7715-650-ERP-0002)).

In the event of a spill with the potential for shoreline contact where Santos is not the Control Agency, the ongoing response objectives, methodology, deployment locations and resource allocation will be controlled by the relevant Control Agency and therefore may differ from that included below.

Information gathered during monitor and evaluate activities and operational monitoring (including shoreline clean-up assessments) and assessed through an Operational NEBA will guide the selection of protection and deflection locations and techniques.

Spill modelling indicates if a worst-case spill were to occur as a result of Ningaloo Vision CoPFAR activities, shoreline accumulation would occur at the moderate threshold (≥100 g/m^2). Accumulation at the moderate threshold is predicted at Ningaloo Coast North after 2 days 6 hours, and Muiron Islands after 2 days 8 hours. Shoreline accumulation at both of these receptors is unlikely, with probability of contact less than 3%. Given that shoreline accumulation ≥100 g/m^2 is predicted, shoreline protection and deflection has been selected as a secondary strategy for the MDO and LOWC scenario. Shoreline protection and deflection techniques include:

- nearshore booming, which can involve different booming arrangements, including:
  - exclusion booming: boom acts as a barrier to exclude the spill from areas requiring protection
  - diversion booming: booms divert the spill to a specific location where it may be removed (e.g. sandy beach)
  - deflection booming: booms deflect the spill away from an area requiring protection.
- berms, dams and dykes – uses sandbags or embankments to exclude oil from sensitive areas
- shoreside recovery – uses nearshore skimmers to collect oil corralled by nearshore booms (also used during shoreline clean-up)
- passive recovery – uses sorbent booms or pads to collect oil and remove it from the environment. This can be used as a pre-impact tactic where sorbents are laid ahead of the spill before making contact with the shoreline

- non-oiled debris removal – removes debris from the shoreline before it is impacted to reduce overall waste volumes from shoreline clean-up.

The effectiveness of these techniques will be dependent on local bathymetry, sea state, currents/tides and wind conditions and the available resources.

Santos has access to sufficient resources through its existing resource capability (Table 14-3).

14.2 Implementation guidance

Table 14-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 14-3 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial protection and deflection operations, unless directed otherwise by the relevant Control Agency, are listed in Table 14-4. The Incident Commander of the Control Agency's IMT (once they assume control) and/or OSC is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 14-2: Implementation guidance – shoreline protection and deflection

Action		Consideration	Responsibility	Complete
Initial Actions	Ensure initial notifications to the relevant Control Agency have been made.	Refer to Section 6.8 for reporting requirements.	Planning Section Chief	☐
	Collect and provide monitor and evaluate information, operational monitoring data and existing sensitivity information/mapping to Control Agency for confirmation of priority protection areas and NEBA.	-	Environment Unit Leader Planning Section Chief	☐
	Actions below are indicative only and are at the final determination of the relevant Control Agency.			
	Conduct Operational NEBA to determine if protection and deflection is likely to result in a net environmental benefit using information from shoreline clean-up assessments (North West Shelf OSM-BIP (7715-650-ERP-0002)).	TRPs exist for the priority protection areas for this activity, further described in Section 6.5.1. TRPs are available on the Santos ER Intranet page[26].	Environment Unit Leader	☐
	If NEBA indicates that there is an overall environmental benefit, develop a Shoreline Protection Plan (IAP Sub-Plan) for each deployment area.	Shoreline Protection Plan may include: • priority nearshore and shoreline areas for protection (liaise with Control Agency for direction on locations) • locations to deploy protection and deflection equipment • permits required (if applicable) • protection and deflection tactics to be employed for each location • list of resources (personnel and equipment) required • logistical arrangements (e.g. staging areas, accommodation, transport of personnel) • timeframes to undertake deployment • access locations from land or sea • frequency of equipment inspections and maintenance (noting tidal cycles) • waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes	Operations Section Chief Planning Section Chief Environment Unit Leader	☐

[26] *Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, Pilbara Region Oiled Wildlife Response Plan and WAMOPRA.*

Action		Consideration	Responsibility	Complete
		• no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first) • shift rotation requirements		
	If required identify vessels with relevant capabilities (e.g. shallow draft) for equipment deployment in consultation with Control Agency.	Ensure vessels have shallow draft and/or a suitable tender (with adequate towing capacity and tie-points) if they are required to access shorelines.	Operations Section Chief Logistics Section Chief	☐
	Deploy shoreline protection response teams to each shoreline location selected and implement response.	If passive recovery and/or non-oiled debris removal has been selected as a tactic, ensure deployment activities prioritise their implementation prior to hydrocarbon contact.	Operations Section Chief On-Scene Commander	☐
Ongoing Actions	Conduct daily re-evaluation of NEBA to assess varying net benefits and impacts of continuing to conduct shoreline protection and deflection activities.	-	Environment Unit Leader	☐
	Report to the Operations Section Chief on the effectiveness of the tactics employed.	-	Shoreline Response Programme Manager – AMOSC core group responder	☐
	Response teams to conduct daily inspections and maintenance of equipment.	Shoreline protection efforts will be maintained through the forward operation(s) facilities set-up at mainland locations under direction of the Control Agency. Response crews will be rotated on a roster basis, with new personnel sourced on an as needs basis from existing human resource suppliers.	Shoreline Response Programme Manager	☐

Table 14-3: Shoreline protection and deflection – resource capability

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
Santos owned nearshore boom/skimming equipment	Santos	Beach Guardian (25 m lengths) Total – 6	Varanus Island – 4 Exmouth - 2	Within 24 hours of IMT call out
		Zoom Boom (25 m lengths) Total – 13	Varanus Island – 8 Exmouth – 5	
		Desmi DBD16 brush skimmer Total – 2	Exmouth – 1 Varanus Island – 1	
	AMSA	Canadyne inflatable	Karratha – 5	

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
AMSA nearshore boom/skimmer equipment		Total – 5		Access to National Plan equipment[27] through AMOSC[28]. Equipment mobilisation times vary according to stockpile location
		Structureflex inflatable Total – 25	Karratha – 10 Fremantle – 15	
		Versatech zoom inflatable Total – 18	Karratha – 5 Fremantle – 13	
		Slickbar – solid buoyancy Total – 2	Karratha – 2	
		Structureflex – solid buoyancy Total – 13	Karratha – 3 Fremantle – 10	
		Structureflex – land sea Total – 60	Karratha – 30 Fremantle – 30 other locations around Australia	
AMOSC nearshore boom and skimming equipment	AMOSC	Beach Guardian Shoreseal boom (25 m lengths) Total – 174	Broome – 4 Exmouth – 20 Fremantle – 19 Geelong – 131	Response via duty officer within 15 minutes of first call; AMOSC personnel available within one hour of initial activation call. Equipment logistics varies according to stockpile location For mobilisation timeframes refer to Table 10-12
		Zoom Boom (25 m lengths) Total – 188	Broome – 8 Exmouth – 20 Fremantle – 34 Geelong - 126	
		Lamor HDB 1300 Boom (200 m) on reel Total - 2	Broome – 2	
		Lamor HDB 1500 Boom (100 m) on reel Total – 3	Fremantle – 1 Geelong – 2	
		Lamor SFB-18 GP Solid Flotation Curtain Boom (30 m lengths) Total – 58	Fremantle – 18 Geelong – 40	
		Minimax 12 brush skimmer	Broome – 1	

[27] Updated AMSA Equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations (NEMO) Portal - https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations

[28] Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
		Total - 5	Exmouth – 1 Fremantle – 2 Geelong - 1	
		Komara 12k disc skimmer Total - 4	Exmouth – 1 Fremantle - 1 Geelong - 2	
		Komara 20k disc skimmer Total - 1	Fremantle - 1	
		Komara 30k disc skimmer Total - 2	Geelong - 2	
		Passive weir skimmer Total – 3	Exmouth – 1 Fremantle – 1 Geelong – 1	
		Ro-vac vacuum skimmer Total - 4	Exmouth – 1 Geelong – 3	
		Desmi GT 185 brush/weir skimmer Total – 2	Exmouth – 1 Geelong – 1	
		Desmi Ro-mop 240 oil mop skimmer Total - 2	Exmouth – 1 Geelong - 1	
		Desmi Ro-mop 260 oil mop skimmer Total - 2	Fremantle – 1 Geelong - 1	
		Skimmer-Lamor Rock Cleaner-Brush Total - 4	Fremantle – 2 Geelong - 2	
		Skimmer-Lamor LWS500-Brush/Weir skimmer Total – 6	Fremantle – 3 Geelong – 3	
		Desmi 250 weir skimmer Total – 1	Geelong – 1	
		Canadyne Multi Head-Brush/Disc/Drum Total – 1	Geelong - 1	
		Versatech Multi Head-Brush/Disc/Drum	Geelong - 1	

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
		Total – 1		
		Egmopol barge with brush skimmer Total – 1	Geelong - 1	
Industry Mutual Aid nearshore boom and skimming equipment	Facilitated by AMOSC	Nearshore boom and skimmers	WA/NT	Access to Industry Mutual Aid through AMOSPlan and facilitated by AMOSC
OSRL nearshore boom/skimming equipment (Note: further booms are available; the listed items are shown as an example). Guaranteed access to 50% of stockpile by equipment type. Access to more than 50% on a case-by-case basis.	OSRL	Air-skirt boom 10 m: 228 Air-skirt boom 20 m: 658 Air-skirt boom 200 m: 4 Beach sealing boom 10 m: 154 Beach sealing boom 15 m: 65 Beach sealing boom 20 m: 113 Inshore recovery skimmers: 126 Range of ancillaries to support above equipment	OSRL global stockpiles at base locations: • UK • Singapore • Bahrain • Fort Lauderdale	Response from OSRL Duty Manager within 10 minutes. Equipment logistics varies according to stockpile location.
Personnel (field responders) for OSR strategies	AMOSC Staff	Total – 12	Fremantle – 5 Geelong – 7	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site
	AMOSC Core Group (Santos)	Total – 16	Perth/NW Australia facilities – 14 Port Bonython (South Australia) – 2	From 24 hours <48 hours to WA locations
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility location across Australia	Location dependent. Confirmed at time of activation

Table 14-4: Shoreline protection and deflection – first-strike response timeline

Task	Time from shoreline contact (predicted or observed)
IMT confirms shoreline contact prediction, confirm if protection of shoreline sensitivities is required and begins sourcing resources	<4 hours
Santos Core Group mobilised to deployment port location	<24 hours
Protection booming equipment mobilised to deployment port location	<24 hours
Waste storage equipment mobilised to deployment port location	<24 hours
Boom deployment vessel mobilised to deployment port location	<24 hours
AMOSC Staff and Industry Core Group mobilised to deployment port location	<24–48 hours
Protection/deflection operation deployed to protection location	60 to 72 hours (weather/daylight dependent)
Minimum Resource Requirements	
Note: Resource requirements for protection and deflection will be situation/receptor specific. TRPs are held by Santos and DoT and have been developed for various NWS locations and are available on the Santos ER Intranet page; TRPs exist for the priority protection areas for this activity, further described in Section 6.5.1 [29]. Indicative first-strike resources for a single site protection area are: • One small vessel suitable for boom deployment • Shoreline (e.g. Beach Guardian) and nearshore booms (e.g. Zoom Boom) plus ancillary equipment (e.g. anchors, stakes) sufficient for protection of shoreline resource • One skimmer appropriate for oil type(s) • Waste storage equipment • One Protection and Deflection Team • Personal protective equipment.	

14.3 Worst-case resourcing requirements

Protection and deflection resourcing requirements have been determined from stochastic modelling results for shoreline accumulation. Ningaloo Coast North is the receptor with the greatest length of shoreline accumulation (19.8 km) at the moderate threshold of ≥100 g/m^2 which was predicted by the MDO vessel collision scenario (refer to Table 6-4). Shoreline accumulation (at the moderate threshold of ≥100 g/m^2) does not occur until day two. This stochastic modelling result represents the maximum length of accumulated shoreline loading at the moderate threshold of ≥100 g/m^2 from all simulations and scenarios and has been used as the basis for worst case resourcing requirements identified in Table 14-5.

Resource requirements for protection and deflection will be situation/receptor specific. TRPs are held by Santos and DoT and are in place for all PPA's (refer to Section 6.5.1).

Table 14-5: Shoreline protection and deflection resource requirements

Location	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days)	Maximum length of shoreline oiled (km) ≥100 g/m²	Estimated No. of required protection and deflection teams to set up and monitor
Ningaloo Coast North	2 days, 4 hours	19.8	1–2
Total estimated Protection and Deflection Teams required			**1–2**

Capability allows for mobilisation of protection and deflection resources (refer to Table 14-3) by day 2–3 if required (Table 14-4).

This may allow sufficient time to organise, mobilise and deploy protection and deflection personnel and equipment prior to the majority of hydrocarbon contact, guided by the ongoing operational monitoring.

A typical shoreline protection and deflection team would consist of 12 personnel as a minimum, comprised of the following:

[29] *Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, Pilbara Region Oiled Wildlife Response Plan and WAMOPRA*

- 1 x Incident Commander/Site Supervisor
- 1 x Shallow draft vessel skipper
- 1 x Shallow draft vessel deckhand
- 9 x Protection and deflection operatives.

The resourcing requirements will be determined based on feedback from SCAT activities, on operational NEBA, and in consultation with DoT as the Control Agency. Shoreline effort will likely consist of a combination of protection and deflection and clean-up, with resources often working together and/or in parallel.

14.4 Environmental performance

Table 14-6 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 14-6: Environmental performance – shoreline protection and deflection

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priority areas		
Response Strategy	**Control Measures**	**Performance Standards [EPS ID]**	**Measurement Criteria**
Shoreline Protection and Deflection	**Response Preparedness**		
	Access to Santos protection and deflection equipment and personnel	[EPS-PD-001] Santos personnel and equipment stored and maintained / available as per Table 14-3.	Santos oil spill response team database; Santos equipment register, Exercise reports
	Access to protection and deflection equipment and personnel	[EPS-PD-002] Maintenance of access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG throughout activity	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
			TRG arrangements
	Protection and deflection small vessel providers for nearshore booming operations are identified	[EPS-PD-004] Maintenance of a list of small vessel providers operating in the North West Region that could be used for nearshore booming	List of small vessel providers
	Response Implementation		
	First strike capability mobilised	[EPS-PD-005] First strike is mobilised in accordance with details and timings as specified in Table 14-4 unless directed otherwise by Control Agency	Incident log
	IAP Protection and Deflection Sub-plan is developed to ensure effective execution and environmental impacts from response are minimised	[EPS-PD-006] IAP Shoreline Protection and Deflection Sub-plan including shoreline/nearshore habitat/bathymetry assessment and waste management is developed to provide oversight and management of shoreline protection and deflection operation, prior to shoreline protection and deflection operations commencing	Incident Log; IAP Shoreline Protection and Deflection Sub-plan
	IMT and Control Agency to agree protection priorities	[EPS-PD-007] Santos IMT to confirm protection priorities in consultation with Control Agency	IAP; Incident log
	Prepare operational NEBA to determine if shoreline protection and deflection activities are	[EPS-PD-008] Records indicate operational NEBA completed prior to shoreline protection and deflection activities commencing. Operational NEBA to be undertaken each	Operational NEBA; Incident Log; IAP

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priority areas		
Response Strategy	**Control Measures**	**Performance Standards [EPS ID]**	**Measurement Criteria**
	likely to result in a net environmental benefit	operational period. Ensure NEBA considers waste management and the possibility of secondary contamination.	
	Use of shallow draft vessels for shoreline and nearshore operations	[EPS-PD-009] Shallow draft vessels are used for shoreline and nearshore operations, unless directed otherwise by the designated Control Agency	Vessel specifications documented in IAP
	Conduct rapid shoreline/nearshore habitat/bathymetry assessment	[EPS-PD-010] Unless directed otherwise by the designated Control Agency, a rapid shoreline/ nearshore habitat/ bathymetry assessment will be conducted prior to nearshore activities	IAP records; Assessment records

15. Shoreline clean-up plan

Table 15-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 15-1: Shoreline clean-up – environmental performance outcome, initiation criteria and termination criteria

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery	
Initiation criteria	• Level 2 or Level 3 spills where shorelines with identified or potential protection priorities that will be, or have been, contacted • NEBA indicates shoreline clean-up will benefit receptors • Approval has been obtained from the Control Agency to initiate response strategy	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓2	✓2
Termination criteria	• As directed by DoT	

15.1 Overview

Shoreline clean-up aims to remove hydrocarbons from shorelines and intertidal habitat to achieve a net environmental benefit. Removal of these hydrocarbons helps reduce remobilisation of hydrocarbons and contamination of wildlife, habitat and other sensitive receptors. Shoreline clean-up is often a lengthy and cyclical process, requiring regular shoreline clean-up assessments (North West Shelf OSM-BIP (7715-650-ERP-0002)) to monitor the effectiveness of clean-up activities and assess if they are resulting in any adverse impacts.

Shoreline clean-up is part of an integrated nearshore / shoreline response to be managed by the relevant Control Agency. Where Santos is not the Control Agency (refer to Table 4-2), it will undertake first-strike activations as required. In this circumstance, the relevant Control Agency will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline clean-up. The information obtained from monitoring and evaluation tactics (refer to Section 10), and operational monitoring (Section 17), will be used by the IMT in the development of the operational NEBA to inform the most effective clean-up tactics (if any) to apply to individual sites. Intrusive shoreline clean-up techniques have the potential to damage sensitive shorelines. The appropriateness of clean-up tactics will be assessed against natural attenuation for sensitive sites. Selection of shoreline clean-up methods and controls to prevent further damage from the clean-up activities are to be undertaken in consultation with the Control Agency and selected based on NEBA.

Spill modelling indicates if a worst-case spill were to occur as a result of Ningaloo Vision CoPFAR activities, shoreline accumulation would occur at the moderate threshold (≥100 g/m^2). Accumulation at the moderate threshold is predicted at Ningaloo Coast North after 2 days 6 hours (209 m^3, 19.8 km of shoreline oiled), and Muiron Islands after 2 days 8 hours (23 m^3, 11.3 km of shoreline oiled). Shoreline accumulation at both of these receptors is unlikely, with probability of contact less than 3%. Given that shoreline accumulation ≥100 g/m^2 is predicted, shoreline clean-up has been selected as a secondary strategy for the MDO and LOWC scenario in case clean-up of shorelines is likely to be required. Shoreline clean-up techniques include:

Shoreline clean-up techniques include:

- Shoreline clean-up assessment – uses assessment processes (refer to North West Shelf OSM-BIP (7715-650-ERP-0002)) to assess shoreline character and shoreline oiling and develop recommendations for response. Typically, this would be the first step in any shoreline clean-up response.
- Natural recovery – oiled shorelines are left untreated and the oil naturally degrades over time.
- Manual and mechanical removal – removes oil and contaminated materials using machinery, hand tools, or a combination of both.
- Washing, flooding and flushing – uses water, steam, or sand to flush oil from impacted shoreline areas.
- Sediment reworking and surf washing – uses various methods to accelerate natural degradation of oil by manipulating the sediment.

Santos has access to sufficient resources through its existing resource capability (Table 15-3).

15.2 Implementation guidance

Table 15-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 15-3 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial shoreline clean-up operations, unless directed otherwise by the relevant Control Agency, are listed in Table 15-4. The Incident Commander of the Control Agency's IMT (once they assume control) and/or the OSC is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 15-2: Implementation guidance – shoreline clean-up

Action		Consideration	Responsibility	Complete
Initial Actions	**Actions below are indicative only and are at the final determination of the Control Agency.**			
	Initiate Shoreline Clean-up Assessment (if not already activated).	Refer to North West Shelf OSM-BIP (7715-650-ERP-0002) for additional information. Unmanned Aerial Vehicles (UAVs) may be necessary for some sensitive environments and where personnel safety is at risk (e.g. dangerous fauna in remote locations).	Environment Unit Leader	☐
	Using results from Shoreline Clean-up Assessment, conduct an Operational NEBA to assess shoreline clean-up suitability and recommended tactics for each shoreline location.	Shoreline Clean-up Assessment Teams are responsible for preparing field maps and forms detailing the area surveyed and make specific clean-up recommendations. The condition of affected shorelines will be constantly changing. Results of shoreline surveys should be reported as quickly as possible to the IMT to help inform real-time decision-making. Engage a Heritage Adviser if spill response activities overlap with potential areas of cultural significance.	Environment Unit Leader	☐
	If the operational NEBA supports shoreline clean-up, prepare a Shoreline Clean-up Plan for inclusion in the IAP.	Shoreline Clean-up Plan may include: • clean-up objectives • clean-up end points (may be derived from Shoreline Clean-up Assessment) • clean-up priorities (may be derived from Shoreline Clean-up Assessment) • assessment and location of staging areas and worksites (including health and safety constraints, zoning) • utility resource assessment and support (to be conducted if activity is of significant size in comparison to the size of the coastal community) • permits required (if applicable) • chain of command for on-site personnel • list of resources (personnel, equipment, personal protective equipment) required for selected clean-up tactics at each site • details of accommodation and transport management • security management • waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes • establish no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first) • shift rotation requirements.	Environment Unit Leader Planning Section Chief Operations Section Chief	☐

Action		Consideration	Responsibility	Complete
		Refer to IPIECA guide: A Guide to Oiled Shoreline Clean-up Techniques (IPIECA-IOGP 2016c) for additional guidance on shoreline clean-up planning and implementation.		
	In consultation with the Control Agency, procure and mobilise resources to a designated port location for deployment, or directly to location via road transport.	-	Logistics Section Chief Supply Unit Leader Deputy Logistics Officer (DoT IMT)	☐
	Deploy Shoreline Clean-up Response Teams to each shoreline location to begin operations under direction of the Control Agency.	Each clean-up team to be led by a Shoreline Response Team Leader, who could be an AMOSC Core Group Member or trained member of the AMSA administered National Response Team. Clean-up teams and equipment will be deployed and positioned as per those observations by the Shoreline Clean-up Assessment Teams in consultation with the Control Agency. Team members will verify the effectiveness of clean-up, modifying guidelines as needed if conditions change.	Operations Section Chief Logistics Section Chief Deputy Logistics Officer (DoT IMT)	☐
Ongoing Actions	Shoreline Response Team Leader shall communicate daily reports to the IMT Operations Section Chief to inform of effectiveness of existing tactics and any proposed tactics and required resources.	Where possible, maintain some consistency in personnel within Shoreline Response Teams. If the same personnel are involved in Shoreline Clean-up Assessment and clean-up, they will be better placed to adapt their recommendations as the clean-up progresses and judge when the agreed end points have been met.	Shoreline Response Team Leader Operations Section Chief	☐
	The IMT Operations Section Chief shall work with the Planning Section Chief to incorporate recommendations into the Incident Action Plans for the following operational period, and ensure all required resources are released and activated through the Supply Unit Leader and Logistics Section Chief.	-	Operations Section Chief Planning Section Chief Supply Unit Leader Logistics Section Chief	☐
	Monitor progress of clean-up efforts and report to the Control Agency.	-	Operations Section Chief On-Scene Commander Deputy OSC (Control Agency FOB)	☐

Table 15-3: Shoreline clean-up – resource capability

Equipment type / Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
Manual clean-up tools (shovels, rakes, wheelbarrows, bags, etc.)	AMOSC shoreline kits	Shoreline support kits first-strike Total – 2	Fremantle – 1 Geelong – 1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; equipment logistics varies according to stockpile location (Table 10-12)
	Santos	Shoreline clean-up container	Varanus Island – 1	Within 12 hours for deployment from Varanus Island
	Hardware suppliers	As available	Karratha / Exmouth / Perth	-
Shoreline flushing (pumps/hoses)	AMOSC	Shoreline flushing kit 3” Total – 2	Fremantle –1 Geelong – 1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes see Table 10-12
		Shoreline flushing kit 4” Total – 1	Geelong -1	
		Shoreline impact lance kit Total – 1	Geelong – 1	
Nearshore booms/ skimmers	AMOSC AMSA Industry Mutual Aid	Refer to Protection and Deflection (Table 14-3) -		-
Decontamination/staging site equipment	AMOSC	Decontamination-kit (PPE) Total - 3	Broome – 1 Exmouth – 1 Geelong -1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes see Table 10-12
		Decontamination kit Locker Total – 3	Exmouth – 1 Fremantle – 1 Geelong – 1	
		Decontamination – vehicle washdown trailer Total – 2	Fremantle – 1 Geelong – 1	
		Decontamination – Decon. Support trailer Total – 1	Geelong – 1	

Equipment type / Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
	AMSA	Decontamination station Total – 4	Karratha –2 Fremantle – 2	Access to National Plan equipment[30] through AMOSC[31]. Equipment mobilisation times vary according to stockpile location
	Oil spill equipment provider (e.g. Global Spill., PPS)	As available	Perth	Subject to availability
Waste storage (including temporary storage and waste skips and tanks for transport)	AMOSC temporary storage	Fast tanks (9,000 L and 3,000 L) Total – 8	Geelong – 4 Fremantle – 2 Exmouth – 2	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes see Table 10-12
		Vikotank (13,000 L) Total – 2	Broome – 1 Geelong – 1	
		Lamor (11,400 L) Total – 4	Fremantle – 4	
		IBCs (1 m^3) Total – 18	Geelong – 18	
	AMSA temporary storage	Fast tanks – (10 m^3) Total – 22	Darwin – 2 Karratha – 2 Fremantle – 4 Adelaide – 1 Brisbane – 2 Devonport – 2 Melbourne – 1 Sydney – 4 Townsville – 4	Access to National Plan equipment through AMOSC. Equipment mobilisation times vary according to stockpile location
		Structureflex – (10 m^3) Total – 3	Brisbane – 1 Adelaide – 2	
		Vikoma – (10 m^3) Total – 20	Darwin – 1 Adelaide – 1	

[30] Updated AMSA Equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations (NEMO) Portal - https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations

[31] Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Equipment type / Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
			Brisbane – 1 Devonport – 2 Fremantle – 4 Fremantle – 3 Melbourne – 2 Sydney – 2 Townsville – 4	
	Santos Waste Management Service Provider	Refer to Waste management (Section 18)	Perth, Karratha	<24 hours
Personnel (field responders) for OSR strategies	AMOSC Staff	Total – 12	Fremantle – 5 Geelong – 7	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site
	AMOSC Core Group (Santos)	Total – 16	Perth/NW Australia facilities – 14 Port Bonython (South Australia) – 2	<12 hours <48 to WA locations
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility location across Australia	Location dependent. Confirmed at time of activation
	Santos contracted Work Force Hire company (e.g. Dare)	As per availability (up to 2,000)	Australia-wide	Subject to availability (indicatively 72+ hours)

Table 15-4: Shoreline clean-up – first-strike response timeline

Task	Time from shoreline contact (predicted or observed)
IMT confirms shoreline contact prediction, confirms applicability of strategy and begins sourcing resources.	<4 hours
Santos Offshore Core Group mobilised to deployment port location.	<24 hours
Clean-up equipment mobilised to deployment port location.	<24–48 hours
Waste storage equipment mobilised to deployment port location.	<24 hours
Remote island transfer vessel (if required) mobilised to deployment port location.	<24 hours
AMOSC Staff, Industry Core Group and Labour Hire mobilised to site/deployment port location.	<48 hours
Clean-up operation deployed to clean-up area under advice from Shoreline Assessment Team.	<60-72 hours (weather/daylight dependent)
Minimum Resource Requirements	
Resource requirements for shoreline clean-up will be situation/receptor specific. If developed for the area/receptor, TRPs will outline suggested resource requirements and recommend shoreline assessments (as part of operational monitoring - Section 17) be conducted prior to clean-up to confirm techniques. TRPs are held by Santos and DoT. For further description on relevant TRPs for this activity, refer to Section 6.5.1. Indicative minimum requirements for one Santos-activated shoreline clean-up team are: • manual clean-up/shoreline flushing equipment kit • waste storage (bags, temporary storage tanks, skips as appropriate) • decontamination/staging equipment kit • personal protective equipment. One clean-up team comprises: • one Team Leader (AMOSC staff, Industry Core Group or Santos Core Group) • 10[32] shoreline clean-up responders (AMOSC Core Group, Santos contracted labour hire personnel).	

15.3 Shoreline clean-up resources

Shoreline clean-up equipment available for use by Santos is a combination of Santos owned, AMOSC, AMSA, DoT and OSRL equipment as well as other industry resources available through the AMOSPlan mutual aid arrangements. Shoreline consumables are available through hardware, PPE and specialist oil/chemical spill suppliers and mobile plant equipment is available through hire outlets in Karratha, Broome, Perth and other regional centres. Where vessel deployments are required, Santos will leverage from existing contracted vessel providers in the first instance, and if required will source vessels from vendors that Santos already has a master service agreement with, or spot hiring vessels as needed. The Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) contains the specification for various types of vessel that may be required in an oil spill response, including vessels for shoreline clean-up support.

Shoreline clean-up personnel available to Santos is a combination of AMOSC Staff, AMOSC Core Group Responders (comprising AMOSC trained Santos and Industry personnel), OSRL responders, State Response Team members and National Response Team members. Personnel for manual clean-up and mobile plant operation can be accessed through Santos' labour hire arrangements.

The level of deployment of equipment and personnel for clean-up will be commensurate to the spatial extent of shoreline contact, the volume of oil arriving and the sensitivity and access constraints of the shoreline in question. Deployment will be under the direction of the relevant Control Agency and the advice of shoreline clean-up specialists from AMOSC Core Group and National/State response teams. Shoreline clean-up assessments (North West Shelf OSM-BIP (7715-650-ERP-0002))will provide information to guide the clean-up strategy and deployment of resources.

[32] *Remote islands and ecologically sensitive locations will have reduced personnel numbers to reduce impacts from clean-up operations (Refer to Section 15.4.2)*

15.4 Worst-case resourcing requirements

Stochastic spill modelling indicates shoreline loading of up to a maximum of ~209 m^3 of MDO at Ningaloo Coast North (19.8 km of shoreline oiled). Hydrocarbons could also load onto shorelines of the Muiron Islands (maximum ~23 m^3, 11.3 km of shoreline oiled).

No shoreline accumulation at or above the moderate threshold of ≥100 g/m^2 was predicted for the LOWC scenario, however shoreline clean-up has been retained as a secondary strategy for the LOWC scenario in case there are areas contacted in the event of a spill.

Based on the worst case length of oiled shoreline at Ningaloo Coast North of 19.8 km, two (2) shoreline clean-up teams is considered the most viable approach to the shoreline clean-up effort due to various operational and environmental considerations (Section 15.4.1). Oil does not start accumulating (at the moderate threshold) until day 2.

Resourcing requirements for shoreline oil operations have been conservatively determined based on a manual clean-up rate of 1 m^3 of oily waste per person per day (6 m^3 total per day). A bulking factor of 10 has been applied to manual clean-up activities (IPIECA-IOGP 2016b). The resourcing estimate considers:

- the size of a shoreline clean-up team for a remote/sensitive location (6 persons, consisting of 1 x Shoreline Clean-up Supervisor / Incident Commander and 5 x operatives, given accumulation is mainly expected on remote island shorelines)
- the timeframe in which teams could achieve manual clean-up of all shorelines.

Note that this does not include all possible spill scenarios and that a single spill may contact other receptors and at different volumes, as presented in Section 6.3. The information presented in Table 15-3 demonstrates that Santos can obtain the resources to scale up to the worst-case shoreline accumulation volumes. In the event of an incident, Santos would use initial monitor and evaluate data (e.g. trajectory modelling and aerial surveillance) to determine where the available resources should be allocated for an effective clean-up response.

15.4.1 Operational and environmental considerations affecting resourcing

Tidal ranges in the EMBA can range up to 4 m. In areas close to Barrow Island, and Montebello Islands the shallow bathymetry results in large areas of exposed seabed at low tide and strong currents persist close to the Islands (Chevron Australia 2014). In addition, much of the coastline is remote and inaccessible via road, making many shoreline clean-up techniques difficult and their use may result in greater environmental impacts. In addition, the remote nature, potential presence of dangerous fauna (i.e. saltwater crocodiles and Irukandji jellyfish) present significant safety risks to responders working in these environments.

Large scale operations involving large numbers of personnel may cause adverse environmental impacts at many of these sensitive shoreline locations. The constant removal of oil, even via manual removal can result in the removal of substrate (e.g. sand, pebbles). If intrusive clean-up is conducted frequently, over a long period of time and along contiguous lengths of coastline, this may result in geomorphological changes to the shoreline profile and adverse impacts to shoreline invertebrate communities which provide an array of ecosystem services (Michel *et al.* 2017).

Given the safety constraints and ecological sensitivities of these shorelines, shoreline clean-up operations should be conducted by smaller teams for longer periods of time. Intermittent manual treatment (<20 visits/month) and use of passive recovery booms is likely to be more effective than intrusive methods (e.g. intrusive manual removal >20 visits/month). Although this may take longer to undertake a clean-up, it is considered that the benefits outweigh the impacts as smaller teams are more targeted, recovering more oil and less sand and debris, reducing trampling of oil into the shore profile and minimising ecological impacts on the shorelines and their sensitive species.

Where shoreline based manual removal is safe and deemed advantageous by shoreline clean-up assessment teams and the operational NEBA, this should be conducted via land access (if possible) or via suitable vessels. However, it should be noted that it is generally not feasible to move response equipment into and out of mangroves, tidal flats and delta environments without causing excessive damage. Even foot traffic must be minimised, either by laying down wooden walkways or relying on vessel-based activities as much as possible (API 2020). Santos has considered the access limitations, safety issues and number of clean-up teams that may be able to operate in each of these environments. A summary of these findings is presented below.

MDO is a light product and although shoreline clean-up resources are planned for, not all the oil may need to be removed (or be able to be removed) as it will continue to weather rapidly after beaching and is likely to disperse naturally. Shoreline clean-up may be more effective for Van Gogh Crude, given it has a moderate concentration (61.7%) of persistent hydrocarbons, with weathering and dispersion expected to be relatively slow.

15.4.2 Remote island deployment

For shoreline clean-up of remote islands (refer to Table 6-3) the following process could be implemented so as to minimise the secondary impacts of high numbers of spill response personnel on shorelines. If shoreline contact is predicted with locations where TRPs exist, the TRP will be used to plan the deployment. Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, and WAMOPRA.

Vessels are to be mobilised to the designated deployment port to mobilise shoreline clean-up teams by water. The shoreline clean-up will be undertaken through on-water deployment to the defined shorelines in four stages:

1. Drop off six-person clean-up containers (contents list in Appendix J) to shoreline contact locations defined by IMT through observation data; or if locations are too sensitive to be used as staging sites, then transfer equipment via landing barge for offsite staging.
2. Deploy marine and environmental specialists to demarcate the clean-up zones with barrier posts and tape to prevent secondary impacts to flora and fauna by the clean-up teams.
3. Deploy clean-up teams in six person squads with a trained/competent shoreline responder as a Team Leader to conduct clean-up methods (flushing, bag and retrieve, etc.) with all waste being bagged and stored in temporary storage areas lined with damp-proof coarse (DPC) grade HDPE sheeting above the high-tide mark.
4. Deploy waste pickup landing barges to retrieve collected wastes from the temporary storage areas and to complete the shoreline clean-up and final polishing.

Multiple six-person teams are to be used based on the actual volume of oil deposited, which will be determined via shoreline clean-up assessments (North West Shelf OSM-BIP [7715-650-ERP-0002]).

15.5 Shoreline clean-up decision guides

To assist with planning purposes, guidance for the selection of appropriate shoreline response strategies based on shoreline sensitivities is provided within Appendix K.

Operational guidelines for shoreline response activities including worksite preparation, manual and mechanical oil removal and vessel access for remote shorelines are included in Appendix L.

The *WA DoT Incident Management Plan – Marine Oil Pollution (*WA DoT2023b*)* also provides guidance on shoreline clean-up techniques.

15.6 Environmental performance

Table 15-5 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 15-5: Environmental performance – shoreline clean-up

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards [ESP ID]**	**Measurement Criteria**
Shoreline Clean-Up	**Response Preparedness**		
	Access to Santos shoreline clean-up personnel	[EPS-SCU-001] Access to shoreline clean-up equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG maintained throughout activity.	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
			TRG Arrangements
	Access to Santos shoreline clean-up personnel	[EPS-SCU-002] Santos personnel available as per Table 15-3	Santos oil spill response team database
	Access to shoreline clean-up labour hire personnel	[EPS-SCU-003] Maintenance of contract with labour hire provider	Labour hire contract
	Onboarding procedure to access shoreline clean-up labour hire personnel	[EPS-SCU-004] Maintenance of an onboarding procedure for oil spill response labour hire	Onboarding procedure
	Access to vessels suitable for remote island transfers of equipment, personnel and waste.	[EPS-SCU-005] MSAs with multiple vessel providers maintained throughout activity	MSAs with multiple vessel providers; Vessel details show suitability
	Vessel requirements for offshore island shoreline clean-up operations are identified	[EPS-SCU-006] Maintenance of vessel specification for remote island shoreline clean-up operations	Vessel specifications within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Response Implementation		
	First strike capability mobilised	[EPS-SCU-007] First strike is mobilised in accordance with details and timings as specified in Table 15-4 unless directed otherwise by the Control Agency	Incident log
	Shoreline clean-up operations will be implemented under the direction of the Control Agency to ensure	[EPS-SCU-008] Clean-up strategies will be implemented under the direction of the Control Agency. Santos will make resources available to the Control Agency.	Incident log

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards [ESP ID]**	**Measurement Criteria**
	effective and coordinated execution		
	IMT and Control Agency to agree protection priorities	[EPS-SCU-012] Santos IMT to confirm protection priorities in consultation with the control agency.	IAP; Incident log
	Prepare operational NEBA to determine if shoreline clean-up activities are likely to result in a net environmental benefit	[EPS-SCU-013] Records indicate operational NEBA completed prior to shoreline activities commencing. Operational NEBA to be undertaken each operational period. Ensure NEBA considers waste management and the possibility of secondary contamination.	Operational NEBA; Incident Log; IAP
	NEBA included in development of following operational period IAP	[EPS-SCU-014] Effectiveness of shoreline clean-up to be evaluated by Team Leaders and reported to IMT for inclusion in NEBA. NEBA undertaken every operational period by the relevant Control Agency to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan	IAP Incident log
	IAP Shoreline Clean-up Sub-plan is developed to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-015] IAP Shoreline Clean-up Sub-plan including waste management is developed to provide oversight and management of shoreline clean-up operation	Incident Log; IAP Shoreline Protection and Deflection Sub-plan
	Santos AMOSC core group responders available to the Control Agency for shoreline clean-up positions.	[EPS-SCU-016] Santos will make available AMOSC Core Group responders, or other appropriately trained responders, for shoreline clean-up team positions to the Control Agency.	Incident log
	Equipment for shoreline clean-up made available to the Control Agency from Santos, AMOSC and OSRL stockpiles	[EPS-SCU-017] Santos will make available to the Control Agency equipment from AMOSC and OSRL stockpiles	Incident log
	Access plans are developed to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-018] Access plans for shoreline operations will be developed. Unless directed otherwise by the Control Agency, Access plans will prioritise use of existing roads and tracks, establish demarcation zones to protect sensitive areas and select vehicles appropriate to conditions.	IAP demonstrates requirement is met
	Operational restrictions of vehicle and personnel movement are established to limit erosion and compaction	[EPS-SCU-019] Unless directed otherwise by the designated Control Agency, operational restrictions on movement of personnel and vehicle, including vehicle types and traffic volumes, are established to minimise impacts from erosion and compaction.	IAP demonstrates requirement is met
	Soil profile assessment is undertaken prior to earthworks to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-020] Unless directed otherwise by the designated Control Agency, a soil profile assessment is conducted prior to earthworks	Soil Profile Assessment; IAP; Incident Log

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards [ESP ID]**	**Measurement Criteria**
	Pre-cleaning and inspection of equipment (quarantine) is undertaken to minimise environmental impacts from response on offshore islands	[EPS-SCU-021] Vehicles and equipment provided by Santos are verified as clean and invasive species free prior to deployment to offshore islands	Quarantine documentation; IAP; Incident Log
	If spill response activities overlap with potential areas of cultural significance, a Heritage Advisor will be engaged	[EPS-SCU-022] In consultation with the Control Agency, engage a Heritage Advisor to provide advice on any sites of cultural significance that may be affected directly by the spill, or indirectly through implementation of spill response measures.	Documented in IAP; Incident Log
	Select forward staging areas in consultation with DoT and DBCA	[EPS-SCU-023] Any establishment of forward staging areas at shoreline areas done under direction or in consultation with DoT and DBCA	Incident Log; IAP
	Establish demarcation zones in sensitive areas	[EPS-SCU-024] Unless directed otherwise by the Control Agency, demarcation zones are mapped out in sensitive habitat areas for vehicle and personnel movement, considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat.	IAP demonstrates requirement is met
	Stakeholder consultation for deployments in coastal areas	[EPS-SCU-025] Consultation is undertaken with relevant stakeholders prior to deployment of resources to townships and marine/coastal areas	Consultation records

16. Oiled wildlife response

Note: The WA DoT is the Control Agency and DBCA is the Jurisdictional Authority and lead agency for oiled wildlife response within WA State waters. Santos and AMSA are the Control Agencies for oiled wildlife response within Commonwealth waters from facility and vessel spills respectively.

Table 16-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 16-1: Oiled wildlife response – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement tactics in accordance with Santos Oiled Wildlife Response Framework Plan (7700-650-ERP-0017) to prevent or reduce impacts, and to humanely treat, house, release or euthanise wildlife.	
Initiation criteria	Monitor and evaluate information and/or operational monitoring data shows that wildlife are contacted, or are predicted to be contacted, by a spill.	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓1	✓1
Termination criteria	• Oiling of wildlife have not been observed over a 48-hour period, and • Oiled wildlife have been successfully rehabilitated, and • Agreement is reached with Jurisdictional Authorities and stakeholders to terminate the incident response.	

16.1 Overview

The short-term effects of hydrocarbons on wildlife may be direct such as the external impacts from coating or internal effects from ingestion and inhalation. Oiled wildlife response (OWR) includes wildlife surveillance/reconnaissance, wildlife hazing, pre-emptive capture and the capture, cleaning, treatment and rehabilitation of animals that have been oiled. In addition, it includes the collection, post-mortem examination, and disposal of deceased animals that are found in the vicinity of an oil spill or are reasonable suspected of have succumbed to the effects of oiling.

Long-term effects of a spill on wildlife may be associated with loss/degradation of habitat, impacts to food sources and impacts to reproduction. An assessment of such impacts is covered in Section 7.2 and Section 7.3 of the EP and post-spill via scientific monitoring (Section 17).

Table 16-2 provides guidance on the designated Control Agency and Jurisdictional Authority for OWR in State and Commonwealth waters. For a petroleum activity spill in Commonwealth waters, Santos acts as the Control Agency and will be responsible for the wildlife response. The Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) will be referred to for guidance for coordinating an OWR when Santos is the Control Agency and for the OWR first-strike response, otherwise the relevant State OWR Plan will be referred to, as described below.

The key plan for OWR in WA is the WA Oiled Wildlife Response Plan (WAOWRP) (DBCA 2022a). The WAOWRP establishes the framework for preparing and responding to potential or actual wildlife impacts during a spill and sets out the management arrangements for implementing an OWR in conjunction with the SHP-MEE. It is the responsibility of DBCA to administer the WAOWRP under the direction of the DoT (Table 16-2). The Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) is consistent with and interfaces the WAOWRP and the WA Oiled Wildlife Response Manual (WA OWR Manual) (DBCA 2022b).

If a spill enters State waters, DBCA is the Jurisdictional Authority for wildlife, and for Level 2/3 spills, will also lead the oiled wildlife response under the control of the DoT. DBCA is the State Government agency responsible for administering the *Biodiversity Conservation Act 2016* (*BC Act*), which has provisions for authorising activities that affect wildlife.

For Level 1 spills in State waters, Santos will be the Control Agency, including for wildlife response. It is, however, an expectation that for Level 2/3 petroleum activity spills, Santos will conduct the initial first-strike response actions for wildlife and continue to manage those operations until DBCA is activated as the lead agency for wildlife response and formal handover occurs. Following formal handover, Santos will function as a support organisation for the OWR and will be expected to continue to provide planning and resources as required.

Table 16-2: Jurisdictional and Control Agencies for oiled wildlife response

Jurisdictional boundary	Spill source	Jurisdictional Authority for OWR	Control Agency		Relevant documentation
			Level 1	Level 2/3	
Commonwealth waters (3–200 nautical miles from territorial/state sea baseline)	Vessel	DCCEEW	AMSA		Western Australia Oiled Wildlife Plan (WAOWRP) Western Australia Oiled Wildlife Response Manual Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017)
	Petroleum activities		Titleholder		
Western Australian (WA) state waters (State waters to 3 nautical miles and some areas around offshore atolls and islands)	Vessel	DBCA	WA DoT[33]		
	Petroleum activities		Titleholder	WA DoT	

16.2 Wildlife priority protection areas

For planning purposes, determination of wildlife priority protection areas is based on stochastic modelling of the worst-case spill scenarios, the known presence of wildlife and in consideration of the following:

- presence of high densities of wildlife, threatened species and/or endemic species with high site fidelity
- greatest probability and level of contact from floating oil and/or shoreline accumulation
- shortest timeframe to contact.

The wildlife priority protection areas for Ningaloo Vision CoPFAR activities are outlined in Table 16-3 and align with the priority protection areas for spill response described in Section 6.5.

Depending on the timing of a potential hydrocarbon spill, certain species could be more impacted because of key seasonal biological activities such as breeding, mating, nesting hatching or migrating.

Table 16-4 provides further detail of key wildlife activities in the Pilbara region and the corresponding time of year.

Table 16-3: Wildlife priority protection areas

Wildlife priority protection area	Key locations / fauna type	Reason
Barrow Island	Turtles: • Western side of Barrow Island (green turtles) • Eastern side of Barrow Island (flatback turtles) • Turtle Bay north beach, north and west coasts and John Wayne Beach (loggerhead and hawksbill turtle nesting)	• Regionally and nationally significant green turtle (*Chelonia mydas*) (*western side*) and flatback turtle (*Natator depressus*) (eastern side) nesting beaches, Turtle Bay north beach, North and west coasts - John Wayne Beach, loggerhead turtle (*Caretta caretta*) and hawksbill turtle (*Eretmochelys imbricata*)
	Birds: • Double Islands (migratory birds) • Bandicoot Bay and widespread on Barrow Island (migratory birds)	• Migratory birds (important habitat): – 10th of top 147 bird sites; – Highest population of migratory birds on Barrow Island Nature Reserve (south-south-east of the Island); Double Island has important bird nesting habitat (shearwaters [*Puffinus sp.*] and sea eagles [*Haliaeetus sp.*])
Muiron Islands	South Island – Loggerhead turtle	• Major loggerhead turtle (*Caretta caretta)* nesting site, significant green turtle (*Chelonia mydas*) nesting site, low density hawksbill turtle (*Eretmochelys imbricata*) nesting site, occasional flatback turtle (*Natator depressus*) presence

[33] *If an OWR is required in WA State waters, the DBCA is responsible for the administration of the Western Australian Oiled Wildlife Response Plan (WAOWRP) under the direction of the DoT.*

Wildlife priority protection area	Key locations / fauna type	Reason
	-	• Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*) nesting colony, birds forage at sea in large aggregations. Crested tern (*Thalasseus bergii*) nesting colony. • Humpback whale (*Megaptera novaeangliae*) migration
Ningaloo Coast North	North Mauds Landing, south of Point Cloates, Mandu Creek to Yardie Creek, Jurabi point, Gnarraloo Bay and Cape Farquhar	• Loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*), and hawksbill turtle (*Eretmochelys imbricata*) • Turtle nesting and breeding Nov to Mar with peak in late Dec/ early Jan
	Main breeding areas at Mangrove Bay, Mangrove Point, Point Maud, the Mildura wreck site and Fraser Island	• 33 species of seabird and avifauna (Including Eastern Curlew) • Seabird nesting Sep to Feb
	-	• Pygmy blue whales (*Balaenoptera musculus brevicauda*) (foraging area) – Migration: Apr to Aug • Dugongs (*Dugong dugon*) (Marine/migratory) (breeding and foraging) • Seasonal aggregations of whale sharks (*Rhincodon typus*) (Mar to Jul) and manta rays

Table 16-4: Key wildlife activities in the Pilbara Region and corresponding time of year

Wildlife Type	Activity	Period
Humpback whales	Migration pathway to and from Kimberley calving grounds	Peak between Jun–Aug
Pygmy blue whales	Foraging and migration pathway along the Western Australian shelf break	Apr-Dec
Dugong	Breeding Mating	Mar–Aug Aug–Mar
Marine turtles	Nesting Hatching	Sep–Dec Jan–Apr
Shorebirds	Migratory pathway stop over	Sep–Apr

16.3 Magnitude of wildlife impact

Given the distribution and behaviour of wildlife in the marine environment, a spill which only impacts offshore waters is likely to result in limited opportunities to rescue wildlife. In such instances, continued wildlife reconnaissance, carcass recovery, sampling of carcasses that cannot be retrieved and scientific monitoring are more likely to be the focus of response efforts. In contrast, a spill which results in shoreline accumulation is likely to result in far greater wildlife impacts and opportunities to rescue wildlife.

The modelling for the worst-case spill scenarios for the Ningaloo Vision CoPFAR activities predicts that the greatest accumulation of oil will occur at Ningaloo Coast North with contact predicted after day two. Using the WAOWRP (DBCA 2022a) Guide for Rating the Wildlife Impact of an Oil Spill (Table 16-5), and stochastic modelling for the worst-case spill scenarios (Section 6.3), it is predicted that high wildlife impacts have the potential to occur as a result of a worst-case spill scenario associated with this activity. However, the modelling also indicates that the probability of hydrocarbon shoreline accumulation is low (≤ 5%) and therefore the likelihood of high wildlife impacts is likely also to be low.

Table 16-5: WAOWRP Guide for rating the wildlife impact of an oil spill

Wildlife Impact Rating	Low	Medium	High
What is the likely duration of the wildlife response?	<3 days	3-10 days	>10 days
What is the likely total intake of animals?	<10	11-25	>25
What is the likely daily intake of animals?	0-2	2 to 5	>5

Wildlife Impact Rating	Low	Medium	High
Are threatened species, or species protected by treaty, likely to be impacted, either directly or by pollution of habitat or breeding areas?	No	Yes – possible	Yes – likely
Is there likely to be a requirement for building primary care facility for treatment, cleaning and rehabilitation?	No	Yes – possible	Yes – likely

Source: DBCA (2022)

16.4 Implementation guidance

Refer to Section 6 of the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) for guidance on the tasks and responsibilities that should be considered when implementing an OWR when Santos is the Control Agency or prior to formal hand over to the relevant Control Agency. The implementation guidance within the Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) includes:

- Record keeping
- Situational awareness
- Activation of Santos IMT Wildlife Branch
- Notifications
- Santos Oiled Wildlife Rapid Assessment Teams (RATs)
- Wildlife Reconnaissance
- Santos Oiled Wildlife Sample Collection Protocol
- Mobilisation of required resources
- Handover to external Control Agency (if relevant).

The OWR first strike plan will focus on notifications, wildlife reconnaissance and response preparation (refer to Section 6.1 of the Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017]). Refer to Table 16-6 for an indicative timeframe and Appendix P for resource capability. Preventative actions, such as hazing, along with capture, intake and treatment require a higher degree of planning, approval (licences) and skills and will be planned for and carried out under the wildlife portion of the IAP (refer to Section 6.2 of the Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017]).

Table 16-6: Oiled wildlife response – first-strike response timeline

Task	Time from oiled wildlife contact (predicted or observed)
IMT notifies regulatory authorities and AMOSC of oiled wildlife / potential for contact	<2 hours
Mobilise Santos personnel for oiled wildlife reconnaissance (this will be already occurring through aerial observer mobilisation)	<24 hours
Mobilisation of AMOSC oiled wildlife equipment and industry OWR team to forward staging area	<48 hours
Minimum resource requirements	
The requirements for oiled wildlife response will be situation specific and dependent upon reconnaissance reports. First strike resources: • Reconnaissance platforms (refer to Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017] and Appendix P) • 6 x trained industry oiled wildlife response team personnel (AMOSC staff and contractors / AMOSC Industry OWR group) Additional resources: • Refer to Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) • Refer to Appendix P for information on OWR capability and equipment	

16.5 Environmental performance

Table 16-7 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 16-7: Environmental performance – oiled wildlife response

Environmental performance outcome	Implement tactics in accordance with Santos Oil Wildlife Response Framework Plan (7700-650-PLA-0017) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Oiled wildlife response	**Response preparedness**		
	Access to oiled wildlife response equipment and personnel	[EPS-OWR-001] Access to oiled wildlife response equipment and personnel through Santos, AMOSC, AMSA National Plan and OSRL maintained throughout activity as per Appendix P.	Access to National Plan resources through AMSA; AMOSC Participating Member Contract; OSRL Associate Member Contract.
	Access to Santos trained oiled wildlife response personnel	[EPS-OWR-002] Maintain Santos personnel trained on OWR and positioned at Perth and VI	Training records
	Access to labour hire personnel	[EPS-OWR-003] Maintenance of contract with labour hire provider	Labour hire contract
	Labour hire onboarding procedure to access labour hire personnel	[EPS-OWR-004] Maintenance of an onboarding procedure for oil spill response labour hire	Onboarding procedure
	Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017)	[EPS-OWR-005] Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) provides guidance for coordinating an OWR when Santos is the Control Agency and outlines Santos's response arrangements	Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017); Revision records.
	Response implementation		
	First strike capability mobilised	EPS-OWR-006] First strike is mobilised in accordance with details and timings as specified in Table 16-6 unless directed otherwise by relevant Control Agency	Incident log
	OWR Management	[EPS-OWR-007] OWR managed in accordance with the Santos Oiled Wildlife Framework Plan (7700-650-PLA-0017)	Incident log
	Prepare operational NEBA prior to operations commencing	[EPS-OWR-008] Prepare operational NEBA to determine magnitude of wildlife impact and determine if OWR activities are likely to result in a net environmental benefit (particularly in relation to hazing/pre-emptive capture). Operational NEBA to be undertaken each operational period.	IAP; Incident log
	IAP Oiled Wildlife Response Sub-plan developed, including waste management, to provide oversight and management of OWR operations	[EPS-OWR-009] IAP Oiled Wildlife Response Sub-plan is developed to ensure effective, coordinated execution with the Santos Oiled Wildlife Framework Plan (7700-650-PLA-0017) and minimise environmental impacts from response	Incident log indicates IAP Oiled Wildlife Response Sub-plan prepared prior to oiled wildlife response operations commencing
	Oiled Wildlife Sample Collection Protocol	[EPS-OWR-010] Oiled wildlife sample collection carried out in	Incident log

Environmental performance outcome	Implement tactics in accordance with Santos Oil Wildlife Response Framework Plan (7700-650-PLA-0017) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
		accordance with the Santos Oiled Wildlife Sample Collection Protocol	

17. Operational and scientific monitoring

OSM is a key component of the environmental management document framework for offshore petroleum activities, which includes activity EPs and OPEPs. Operational monitoring is instrumental in providing situational awareness of a hydrocarbon spill, enabling the IMT to mount a timely and effective spill response and continually monitor the effectiveness of the response. Scientific monitoring is also the principal tool for determining the extent, severity and persistence of environmental impacts from a hydrocarbon spill and for informing resultant remediation activities.

Santos has developed a North West Shelf OSM-BIP (7715-650-ERP-0002) which describes a program of monitoring oil pollution that will be adopted in the event of a hydrocarbon spill incident (Level 2–3) to marine waters. It aligns with the Joint Industry Operational and Scientific Monitoring Framework (APPEA, 2021) and describes how this Framework applies to Santos activities and spill risks for the geographic extent of the North West Shelf OSM-BIP (7715-650-ERP-0002). The relationship between the Joint Industry OSM Framework and Santos environmental management framework is illustrated in Figure 17-1.

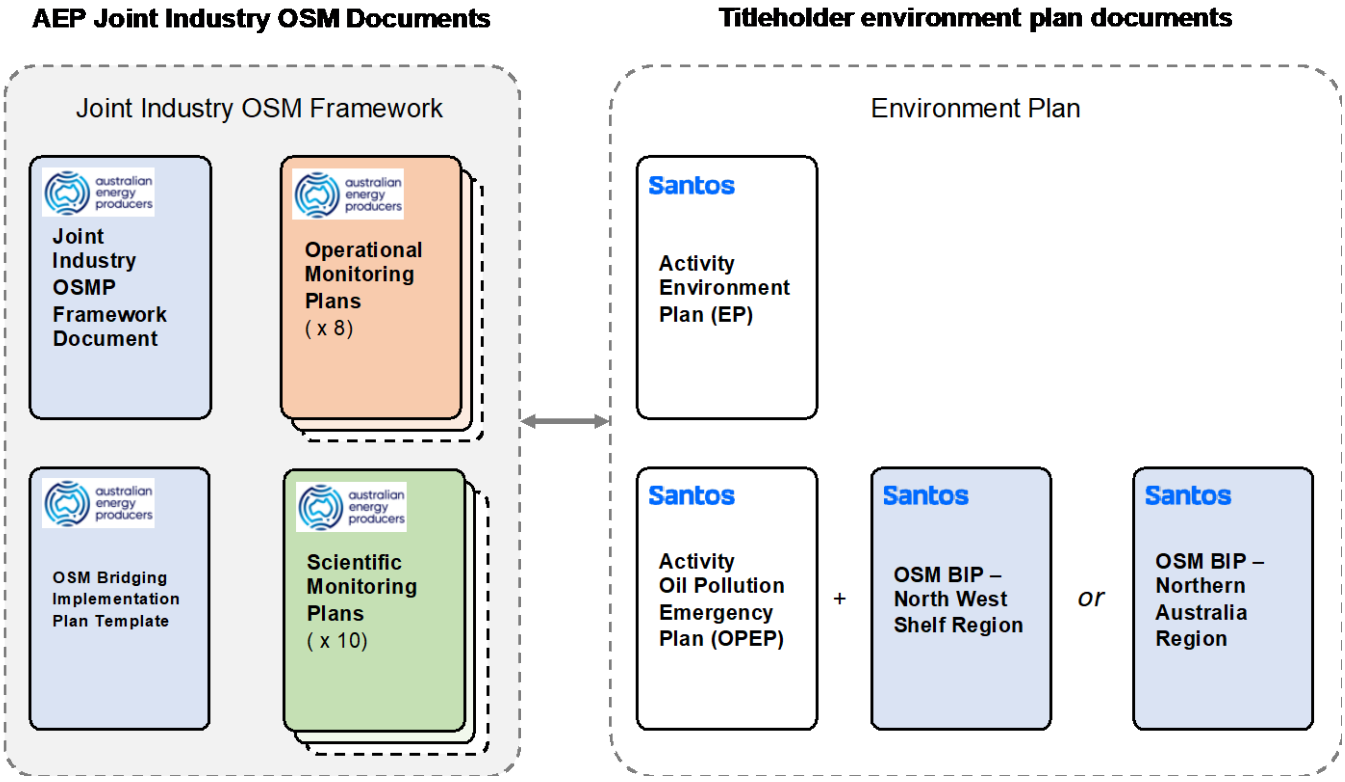

Figure 17-1: Relationship of Joint Industry and Titleholder OSM Documentation

The Northern Australia OSM-BIP is structured so that it can provide a flexible framework that can be adapted to individual spill incidents. A series of Operational Monitoring Plans (OMPs) and Scientific Monitoring Plans (SMPs) form part of the Joint Industry OSM Framework and provide detail on monitoring design, standard operating procedures, data management, quality assurance and quality control and reporting.

There are two types of monitoring that would occur following a Level 2–3 spill event:

- **Operational Monitoring** – which is undertaken during the course of the spill and includes any physical, chemical and biological assessments that may guide operational decisions such as selecting the appropriate response and mitigation methods and / or to determine when to terminate a response activity. This monitoring is additional to the activities (aerial/vessel surveillance, tracking buoys, oil spill trajectory modelling and satellite tracking) performed as part of the Monitor and Evaluate Strategy (Section 10). The design of operational monitoring requires judgements to be made about scope, methods, data inputs and outputs that are specific to the individual spill incident, balancing the operational needs of the response with the logistical and time constraints of gathering and processing information. Information needs to be collected and processed rapidly to suit response needs, with a lower level of sampling and accuracy needed than for scientific purposes. For details on initiation and termination criteria for OMPs refer to the North West Shelf OSM-BIP (7715-650-ERP-0002).
- **Scientific Monitoring**– which can extend beyond the termination of response operations. Scientific monitoring has objectives relating to attributing cause-effect interactions of the spill or associated response with changes to the surrounding environment. Scientific monitoring will be conducted on a wider study

area, extending beyond the spill footprint, will be more systematic and quantitative, and aim to account for natural or sampling variation. For further details on the SMPs refer to the OSM-BIP.

Table 17-1 lists the Joint Industry OMPs and SMPs that are relevant to Santos' Ningaloo Vision CoPFAR activities.

The North West Shelf OSM-BIP (7715-650-ERP-0002) is tailored to Santos' activities in the North West Shelf zone of Western Australia. It includes details on priority locations for monitoring, resourcing requirements; and operational guidance including logistics, mobilisation and permitting; with the exception of capability requirements for OMP: Shoreline Clean-up Assessment. The capability requirements for OMP: Shoreline Clean-up Assessment are typically assessed for each activity, according to stochastic modelling for the worst-case scenario that shows the simulation with the longest length of shoreline contacted, as this criterion influences the number of assessment teams required. Resourcing requirements for OMP: Shoreline Clean-up Assessment for the Ningaloo Vision CoPFAR activities are provided in Appendix M.

The capability assessment for the remaining OMPs and SMPs is assessed against different modelling criteria, as described in the North West Shelf OSM-BIP (7715-650-ERP-0002). Resourcing requirements for OMP: Shoreline Clean-up Assessment for the Ningaloo Vision CoPFAR activities are provided in Appendix M. The North West Shelf OSM-BIP (7715-650-ERP-0002) describes the methodology for assessing the worst-case OSM capability requirements for Santos activities in this region. In summary, Santos assessed the worst-case spill scenario for OSM capability as the scenario contacting the most receptors at the low thresholds at a probability >5% and within 7 days. Santos confirms that all of the Ningaloo Vision CoPFAR spill scenarios (Section 6.1) fit within the OSM combined EMBA and assessment criteria defined within Appendix A of the North West Shelf OSM-BIP (7715-650-ERP-0002). Further, receptors contacted are all included within the baseline priority list in Section 2.2 of the North West Shelf OSM-BIP (7715-650-ERP-0002). This assessment is detailed in Appendix N.

Santos will review the initiation criteria for OMPs and SMPs (Provided in Table 9-1 (OMPs) and Table 9-2 (SMPs) of the Joint Industry Operational and Scientific Monitoring Framework (APPEA, 2021)) when preparing the initial IAPs, and subsequent IAPs. If any initiation criteria are met, then that relevant OMP and/or SMP will be activated via the OSM Services Provider.

Table 17-1: Joint Industry OSM Plans relevant to Ningaloo Vision CoPFAR activities

Operational monitoring	Relevant for Ningaloo Vision CoPFAR activities	Scientific monitoring	Relevant for Ningaloo Vision CoPFAR activities
Hydrocarbon Properties and Weathering Behaviour at Sea	✓	Water Quality Impact Assessment	✓
Water Quality Assessment	✓	Sediment Quality Impact Assessment	✓
Sediment Quality Assessment	✓	Intertidal and Coastal Habitat Assessment	✓
Surface chemical dispersant effectiveness and fate assessment	✓	Seabirds and Shorebirds Assessment	✓
Subsea chemical dispersant effectiveness and fate assessment	×	Marine Mega-fauna Assessment	✓
Rapid Marine Fauna Surveillance	✓	Benthic Habitat Assessment	✓
Shoreline Clean-up Assessment	✓	Marine fish and elasmobranch assemblages assessment	✓
-	-	Fisheries Impact Assessment	✓
-	-	Heritage Features Assessment	✓
-	-	Social Impact Assessment	✓

17.1 Environmental performance

Table 17-2 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 17-2: Environmental performance – scientific monitoring

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
Operational and Scientific monitoring – Preparedness	**Response preparedness**		
	Maintenance of OSM Services Provider contract	[EPS-OSM-002] Maintain contracts with third-party provider/s to provide access to suitably qualified and competent personnel and equipment to assist in the implementation of monitoring	Contract with OSM services provider
	OSM Services Provider capability verified through regular capability reporting	[EPS-OSM-003] Obtain monthly capability reports from OSM services provider to demonstrate suitable resources are available throughout the activity	Monthly capability reports from OSM Services Provider
	Adequacy of existing baseline data sources across the Santos combined EMBA reviewed periodically	[EPS-OSM-004] Regular review of existing baseline data	Baseline data review report
	Water quality monitoring vessels	[EPS-OSM-006] Maintenance of vessel specification for water quality monitoring vessels within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)	Vessel specification
	Pre-completed risk assessment for operational and scientific monitoring activities	[EPS-OSM-016] Pre completed and approved risk assessment is in place with the OSM Services Provider for operational and scientific monitoring activities	OSM Services Provider pre-completed and approved risk assessment
	Access to Santos oil sampling kits	[EPS-OSM-001] Oil sampling kits pre-positioned at Exmouth, Dampier and Varanus Island. Equipment contents as per the Santos Oil and Water Sampling Procedures (7710-650-PRO-0008) Appendix C.	Evidence of deployment to site
	OSM Services Provider testing and exercising	[EPS-OSM-005] Annual testing of OSM Services Provider arrangements and capability	Exercise and testing records
	OSM-BIP reviewed annually	[EPS-OSM-030] Annual review of OSM-BIP	Record of revision
Response implementation			
Operational and Scientific monitoring – Activation and Mobilisation	Activate Operational and Scientific Monitoring Plans	[EPS-OSM-010] OMPs and SMPs will be activated in accordance with the initiation criteria provided in Table 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)	Incident Action Plan and Incident Log confirm OMPs and SMPs are activated in accordance with the initiation criteria provided in Table 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)
	Activation of operational and scientific monitoring plans according to OMPs and SMPs initiation criteria	[EPS-OSM-009] Initiation criteria of OMPs and SMPs will be reviewed during the preparation of the initial Incident Action Plan (IAP) and subsequent IAPs; and if any criteria are met, relevant OMPs and SMPs will be activated	IAP/s Incident log
	OSM BIP	[EPS-OSM-025] Monitoring to be conducted in accordance with the Santos	Incident log;

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
		North West Shelf OSM-BIP (7715-650-ERP-0002)	
	OSM implementation Minimum Standards	[EPS-OSM-026] Implementation of operational and scientific monitoring will comply with the Minimum Standards listed in Appendix A of the Joint Industry OSM Framework (APPEA, 2021)	Incident log;
	OSM Services Provider to commence activation within specified time from initial notification	[EPS-OSM-011] OSM services provider shall commence activation process within 30 mins of initial Call-off Order form being received from Santos	OSM services provider records
	Santos to provide support to OSM Services Provider	[EPS-OSM-012] Santos personnel to support OSM services provider through the provision of operational monitoring information and relative location of sensitive receptors to the spill	Incident log OSM services provider records
	Mobilisation of appropriately specified monitoring vessels	[EPS-OSM-017] Source monitoring vessel(s) with specification in accordance with Section 5.2 of Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)	Incident log
Operational and Scientific monitoring – Water quality and dispersant amenability	Ecotoxicity testing of oil samples to take place	[EPS-OSM-007] Oil samples collected to be sent for laboratory ecotoxicity testing of oil	Incident log
	Ecotoxicity testing to derive species protection triggers	[EPS-OSM-008] 90, 95 and 99% Species protection triggers levels will be derived from ecotoxicity testing results (minimum five species' tests) within 24 hours of receiving all results	Ecotoxicity report from environmental contractor
	Dispersant amenability analysis of oil samples to take place	[EPS-OSM-029] If applicable (not MDO), oil samples sent to laboratory for dispersant amenability	Incident Log
Operational and Scientific monitoring – Shoreline assessment and nearshore operations	Use of shallow draft vessels for shoreline and nearshore operations	[EPS-OSM-020] Shallow draft vessels are used for shoreline and nearshore operations unless directed otherwise by the relevant Control Agency	Vessel specification documentation contained in IAP
	Shoreline clean-up assessment direction and leadership	[EPS-OSM-018] OMP: Shoreline Clean-up Assessment will be implemented under the direction of the relevant Control Agency	Incident log
	SCAT Field Coordinator assessment/selection of vehicle appropriate to shoreline conditions	[EPS-OSM-021] SCAT Field Coordinator assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met
	Conduct shoreline/ nearshore habitat/ bathymetry assessment	[EPS-OSM-022] Unless directed otherwise by the designated Control Agency, a rapid shoreline/ nearshore habitat/ bathymetry assessment is conducted prior to nearshore activities	IAP records; Assessment records
	Establish demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat	[EPS-SM-023] Unless directed otherwise by the designated Control Agency, demarcation zones are mapped out in sensitive habitat areas	IAP demonstrates requirement is met
	Operational restriction of vehicle and personnel	[EPS-OSM-024] Unless directed otherwise by the designated Control Agency, action plans for shoreline	IAP demonstrates requirement is met

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
	movement to limit erosion and compaction	operations include operational restrictions on vehicle and personnel movement	
	Daily SCAT reports issued during SCAT operations	[EPS-OSM-019] Reports from OMP: Shoreline Clean-up Assessment will be provided to the IMT daily, detailing the assessed areas to maximise effective utilisation of resources	Incident log
Operational and Scientific monitoring – Stand-down and termination	Stand-down, termination and post-spill activities	[EPS-OSM-027] Once post-spill SMP monitoring reports are drafted they will be peer reviewed by an expert panel	Monitoring records
	Stand-down, termination and post-spill activities	[EPS-OSM-028] OMPs and SMPs will be terminated in accordance with the termination criteria provided in Tables 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)	Incident Action Plan and Incident Log confirm OMPs and SMPs are terminated in accordance with the termination criteria provided in Tables 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)

18. Waste management

Table 18-1 lists the environmental performance outcome, initiation and termination criteria for this strategy.

Table 18-1: Waste management – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, re-using and recycling waste where possible	
Initiation criteria	Response activities that will be generating waste have been initiated	
Applicable hydrocarbons	**MDO**	**Van Gogh Crude Oil**
	✓1	✓1
Termination criteria	• All waste generated from the oil spill response has been stored, transported and disposed as per the regulatory requirements, and • Agreement is reached with Jurisdictional Authorities to terminate the response	

18.1 Overview

The implementation of some spill response strategies will generate solid and liquid waste that will require rapid management, storage, transport and disposal. It is important that waste is collected and removed efficiently to ensure waste management does not create a bottleneck in response operations.

The type and amount of waste generated during a spill response will vary depending on the spill type/characteristics, volume released, and response strategies implemented. To account for this potential variability, waste management (including handling and capacity) needs to be scalable to allow a continuous response to be maintained.

Where Santos is the Control Agency, or at the request of the designated Control Agency, Santos will engage its contracted Waste Service Provider (WSP) to provide sufficient waste receptacles to store collected waste and manage oily waste collection, transport and disposal associated with spill response activities. The WSP will arrange for all personnel, equipment and vehicles to carry out these activities from nominated collection points to licensed waste management facilities. All transport will be undertaken via controlled-waste-licensed vehicles and in accordance with the Environmental Protection (Controlled Waste) Regulations 2004. Santos' Oil Pollution Waste Management Plan (7715-650-ERP-0001) provides detailed guidance to the WSP in the event of a spill.

Where DoT is the Control Agency, Santos will provide the Deputy Waste Management Coordinator to the DoT IMT Logistics Unit to support the DoT IMT in coordinating waste management services (refer to Table 5-5).

18.2 Implementation guidance

Table 18-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 18-2: Implementation guidance – waste management

Action		Consideration	Responsibility	Complete
Initial actions	Contact WSP (Primary or Secondary Contact Person) and activate Waste Project Manager.	Refer to Incident Response Telephone Directory (SO-00-ZF-00025.020) for contact details.	Logistics Section Chief	☐
	Based on operational modelling and applicable response strategies communicate the type and quantity of empty liquid and solid waste receptacles required to support planned operations.	It is better to overestimate volumes and scale back resources then to underestimate waste volumes.	Logistics Section Chief Planning Section Chief	☐
	Using most recent monitor and evaluate data and any existing and future response activities, determine most suitable locations for waste receptacles to be positioned and for temporary storage locations to be established.	Shoreline waste collection points (temporary storage site) will be determined by the DoT and will depend upon the location of shoreline clean-up activities and staging areas and the availability of vehicle access routes. Consideration should be given to positioning receptacles and locating temporary storage sites to ensure secondary contamination of sensitive receptors is avoided or minimised. The approval of temporary storage sites is given through Department of Water and Environmental Regulation (DWER).	Logistics Section Chief Planning Section Chief Environmental Unit Leader	☐
	For each receival location indicate the anticipated: • material types • material generation rates • material generation quantities • commencement date/time • anticipated clean-up duration • receptacle types required • logistical support requirements • any approvals required from Ports, Local Governments, Landowners, State Government Agencies (refer to *Oil Pollution Waste Management Plan 7715-650-ERP-0001]*).	Consider facilities for waste segregation at source.	Logistics Section Chief Planning Section Chief	☐
	Once the above information is obtained, ensure all necessary waste management information is included in the IAP.	Waste management should be done in accordance with Santos' *Oil Pollution Waste Management Plan (7715-650-ERP-0001)*; and where relevant, the *DoT Waste Management Guidelines (WA)*, the respective Port, Port Operator and/or Ship Owner's waste management plan.	Logistics Section Chief Planning Section Chief Deputy Waste Management Coordinator (DoT IMT) WSP Operations Supervisor	☐
	Mobilise waste management resources and services to agreed priority locations.	-	WSP Operations Supervisor Logistics Section Chief Deputy Waste Management Coordinator (DoT IMT)	☐

Action		Consideration	Responsibility	Complete
Ongoing actions	Provide ongoing point of contact between IMT and WSP.	If DoT is the Control Agency, the Deputy Waste Management Coordinator shall be the point of contact between DoT and the WSP.	Logistics Section Chief Facilities Support Officer (DoT IMT)	☐
	Seek approval from DoT if proposing to bring oiled vessels into Exmouth Boat Harbour and/or proposing to conduct oil transfer at Exmouth Boat Harbour	Approval required from DoT for either of the following at Exmouth Boat Harbour: • Berthing of oiled vessels; • Oil transfer.	Deputy Waste Management Coordinator (DoT IMT) Logistics Section Chief	☐
	Ensure all waste handling, transport and disposal practices comply with legislative requirements.	Alert Logistics Section Chief (or delegate) if any non-compliance is anticipated or detected. Site clean-up, removal and disposal of response waste should be conducted in accordance with Santos' Oil Pollution Waste Management Plan (7715-650-ERP-0001); and where relevant, the DoT Waste Management Guidelines (WA), the respective Port, Port Operator and/or Ship Owner's waste management plan.	WSP Operations Supervisor	☐
	Ensure records are maintained for all waste management activities, including but not limited to: • waste movements (e.g. types of receptacles, receival points, temporary storage points, final disposal locations) • volumes generated at each site (including total volume and generation rates) • types of waste generated at each site • approvals obtained (as required).	-	WSP Operations Supervisor	☐

18.3 Waste approvals

Site clean-up, removal and disposal of response waste should be conducted in accordance with Santos' Oil Pollution Waste Management Plan (7715-650-ERP-0001); and where relevant, the DoT Waste Management Guidelines and the respective Port, Port Operator and/or Ship Owner's waste management plan. In addition, regulatory approval may be required for the temporary storage, transport, disposal and treatment of waste, through the WA Department of Water and Environment Regulation (DWER).

DWER administers the *Environmental Protection Act 1986* (WA) and is the relevant authority for waste management in WA. If required, DoT may establish an Operational Area Support Group, as defined in the SHP-MEE, to request support from relevant WA Government Agencies, including DWER, during a State waters spill response. The Santos Oil Pollution Waste Management Plan (7715-650-ERP-0001) provides detail on the regulatory requirements for each port/location likely to be used for waste management during any spill response operation associated with Santos' activities.

18.4 Waste service provider capability

Detailed guidance on Santos' WSP responsibilities for spill response waste management is provided in the Santos Oil Pollution Waste Management Plan (7715-650-ERP-0001).

Key responsibilities of the WSP include:

- Maintain emergency response standby preparedness arrangements, including:
  - Access to personnel, equipment and vehicles required for a first strike and ongoing response commensurate to Santos worse case spill and waste requirements.
  - Provide primary and secondary contact details for activation of spill response waste management services.
  - Access to suitably trained personnel for completing critical tasks in spill response waste management.
  - Participate in exercises undertaken by Santos.
- Maintain ability to assist in the Control Agency's IAP and Waste Management Sub-plan process as required.
- Mobilise resources to waste collection points identified by the Control Agency.
- Ensure waste handling, transport and disposal practices meet legislative requirements.
- Keep auditable records of waste streams from collection points to final disposal points.
- Provide regular progress reporting to the Control Agency IMT and a final report relating to quantities and destinations of collected waste.
- Provide a project manager responsible for the rollout of spill response resources to meet spill response waste management objectives.
- Provide location-specific Operations Supervisor/s to handle on-site operational aspects (management of personnel and equipment, reporting, liaison with relevant field-based spill responders).

18.5 Waste management resources

Santos has access to capacity to deliver storage receptacles, remove, transport and dispose of all waste material from oil spill response activities to predetermined disposal points.

Table 18-3 provides waste service provider capability for waste removal and storage, which is in excess of the waste management requirements for spill response activities associated with this OPEP. Containment and recovery, protection and deflection and shoreline clean-up are all secondary response strategies requiring waste storage equipment comprising a combination of towable bladders, IBCs, ISO tanks, and inbuilt vessel storage tanks. Stochastic spill modelling indicates worst-case shoreline loading of up to a maximum of ~209 m^3 of MDO at Ningaloo Coast North (19.8 km of shoreline oiled) (refer to Section 15.4). Large amounts of oily waste could be generated. Applying a highly conservative bulking factor of 10 for oily waste management results in 2,090 m^3 which is within WSP capacity (Table 18-3).

Liquid waste from containment and recovery operations can also be handled by the waste service provider weekly liquid waste removal capacity of 5,250 m^3 (Table 18-3) at the port of reception (likely to be Dampier).

Table 18-3: Waste service provider vehicle and equipment availability for waste storage and removal capability (as per Oil Pollution Waste Management Plan [7715-650-ERP-0001])

Plant and Equipment	No.	Capacity	Functionality	Uses per week	Waste stored/shifted per week (m^3)
Waste removal					
Oily waste					
Skip lift truck	14	Lift up to 10 t, 4.3 m^3 per service	Servicing of skip bins	7	420
Front lift trucks	10	28 m^3 body, 11.2 m^3 per service	Servicing of front lift bins	7	784
Side loading truck	10	18 m^3 body, 7.2 m^3 per service	Servicing of MGBs	7	504
Hook lift truck	8	Lift up to 15 t, 17.5 m^3 per service	Servicing of hook lift bins	7	980
Flat bed truck	16	15 pallet spaces, 17.5 m^3 per service	Servicing of bins	7	840
Liquid oil					
Liquid waste tankers (triple 'road-train' configuration)	10	75 m^3	Collection of liquid waste at the port of reception (Dampier)	7	5,250
Waste storage					
Oily waste					
ISO-tainers	15	22 m^3	Various waste streams	2	660
MGBs	500	240 L	Mobile bins	2	240
Offshore 8 pack lifting cradle (MGBs)	2	16 x 240 L MGBs	Able to remove 16 x 240 L MGBs simultaneously	continuous	
Lidded bins	6	1,100 L	contain various waste streams	2	13
Front lift bins	50	3 m^3	various waste streams	2	300
Front lift bins	25	4.5 m^3	various waste streams	2	225
Offshore rated front load bins	100	3 m^3	various waste streams	2	600
Offshore rated bins	45	7 m^3	various waste streams	2	630
Marrell skip bins	60	6–9 m^3, assumed 8 m^3 per service	various waste streams	2	960
Hook lift bins	12	15–30 m^3, assumed 23 m^3 per service	various waste streams	25	6,900
Forklift	4	4 t forklift	All areas	continuous	
				Weekly waste storage capacity	**10,528**
				Weekly total waste removal capacity	**8,778**
				Weekly liquid oil removal capacity	**5,250**

Source: As per Oil Pollution Waste Management Plan (7715-650-ERP-0001)

18.6 Environmental performance

Table 18-4 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 18-4: Environmental performance – waste management

Environmental performance outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, re-using and recycling waste where possible		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
Waste management	**Response preparedness**		
	Access to waste management equipment, personnel, transport and disposal facilities	[EPS-WM-001] Waste management sourced through contract with waste service provider. Contract with waste service provider to be maintained throughout activity.	Contract with WSP for emergency response services; Annual desktop assurance report.
	Access to vessels for waste transport	[EPS-WM-002] MSAs with multiple vessel providers maintained throughout activity.	MSAs with vessel providers
	Vessel requirements for containment and recovery waste transport are identified	[EPS-WM-003] Maintenance of vessel specification for waste storage and transport vessels for containment and recovery	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Response implementation		
	Santos Oil Pollution Waste Management Plan (7715-650-ERP-0001) implemented	[EPS-WM-004] WSP shall: • Appoint a Project Manager within 24 hours of activation • Track all wastes from point of generation to final destination • Provide monthly waste management reports and more regular situation reports during the response until termination criteria are met	Incident log; Waste tracking records
		[EPS-006] WSP to provide liquid oil waste tanks for containment and recovery operations to deployment port, if requested, within 24 hours	Incident log
		[EPS-WM-007] WSP to provide waste bins for oil and oily waste for shoreline clean-up operations to clean-up site or deployment port, if requested, within 24 hours	Incident log

19. Response termination

The decision to terminate the spill response is made in consultation with the relevant Control Agency/s, Jurisdictional Authorities and other Statutory Authorities that play an advisory role. This decision will be made with consideration of:

- the efficacy and benefit of current response options
- any potential for additional pollution
- any potential for additional environmental damage caused by further clean-up efforts
- an assessment of prevailing weather conditions that can increase risk to response teams or increase the efficacy in weathering hydrocarbon.

An operational NEBA will be conducted to inform the decision-making process. Termination criteria are defined within each section of response activities defined within the OPEP.

Upon conclusion of the spill response activity, Santos will:

- prepare detailed reports and collate all documents
- report on the performance objectives of each individual spill response activity that was mobilised
- undertake an inventory of consumables and prepare accounts
- arrange for the return of equipment
- arrange for the refurbishment of consumed equipment
- investigate the cause of the incident and report to relevant authorities
- assess long-term scientific monitoring requirements.

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Appendix A Hydrocarbon characteristics and behaviour

Marine diesel oil (MDO)

ITOPF (2023) categorise MDO is Group II light persistent oil . The physical characteristics of MDO are summarised in Table A-1. In the marine environment, a 10% residual of the total quantity of MDO spilt will remain after the volatilisation and solubilisation processes associated with weathering.

Under low winds (1 m/s), 60% of the surface slick is predicted to remain after 120 hours (5 days). Under moderate winds (5 m/s), 40% of the initial surface slick is predicted to remain after 24 hours, decreasing further to ~10% after 48 hours and ~1% after 72 hours. With high winds (10 m/s), the surface slick is predicted to be almost entirely evaporated and dispersed after 12 hours.

In summary, in the marine environment MDO will behave as follows:

- Will spread rapidly in the direction of the prevailing wind and waves
- In calm conditions evaporation is the dominant process contributing to the fate of spilled MDO from the sea surface and will account for 60–80% reduction of the net hydrocarbon balance
- Has a strong tendency to entrain into the upper water column (0–10 m) (and consequently reduce evaporative loss) in the presence of moderate winds (>10 knots) and breaking waves. However, it re-surfaces when the conditions calm
- The evaporation rate of MDO will increase in warmer air and sea temperatures such as those present around the area
- MDO residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

Table A-1: Properties of MDO

Hydrocarbon type	Density (kg/m^3)	Dynamic viscosity at 20 °C (cSt)	API	Wax content (%)	Pour point °C	Hydrocarbon property classification
MDO	843 (@15 °C)	3.9	36.4	0.05	-36	Group II / light persistent

Source: GHD (2020)

Van Gogh crude

ITOPF (2023) and RPS (2024) categorise Van Gogh crude as a Group IV heavy persistent oil. The physical characteristics of Van Gogh crude are summarised in Table A-2. In the marine environment, a 61.7% residual of the total quantity of Van Gogh crude spilt will remain after the volatilisation and solubilisation processes associated with weathering.

Generally, about 3.8% of the Van Gogh crude mass should evaporate within the first 24 hours (boiling point (BP) < 180 °C); a further 6.6% should evaporate within the first 48 hours (180 °C < BP < 265 °C); and the low volatile portion of 27.9% should evaporate over a longer period (265 °C < BP < 380 °C). Approximately 61.7% (by mass) of Van Gogh crude will not evaporate though will decay slowly over time.

In summary, in the marine environment Van Gogh crude will behave as follows:

- Will spread rapidly in the direction of the prevailing wind and waves
- In calm conditions evaporation is the dominant process contributing to the fate of spilled Van Gogh crude from the sea surface and will account for 10.4% reduction of the net hydrocarbon balance within 24 hours. Evaporation of the residual compounds will slow considerably, and they will then be subject to more gradual decay through biological and photochemical processes
- Has a strong tendency to entrain into the upper water column (0 m – 10 m) (and consequently reduce evaporative loss) in the presence of moderate winds (>10 knots) and breaking waves leaving only a small proportion on the water surface (<0.1%). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves

- The increased level of entrainment in the presence of moderate wind conditions will result in a higher percentage of biological and photochemical degradation in comparison to calm conditions
- Given the proportion of entrained crude and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay over time scales of several weeks.

Table A-2: Properties of Van Gogh crude

Hydrocarbon type	Density (kg/m^3)	Dynamic viscosity at 20 °C (cSt)	API	Wax content (%)	Pour point °C	Hydrocarbon property classification
Van Gogh crude	961 (@15 °C)	662.9	15.7	<5	-15	Group IV / heavy persistent

Source: RPS (2024)

Appendix B Oil spill response ALARP framework & assessment

ALARP assessment framework

Rationale

As of part the regulatory approval requirements for petroleum activities, the EP and/or OPEP must demonstrate that through the implementation of all reasonable control measures environmental risks have been reduced to a level that is As Low As Reasonably Practicable (ALARP).

With respect to hydrocarbon spill risk and response planning, this includes an assessment to demonstrate that the oil spill response control measures are reducing risk to a level that is ALARP.

This ALARP Assessment Framework provides a process to facilitate the identification of all existing and potential spill response control measures, the selection or rejection of which are supported by reasoned arguments.

Guidance documents

Guidance documents used in the preparation of this framework include:

- Oil Spill Risk Assessment and Response Planning Procedure (SO-91-II-20003)
- NOPSEMA Guidance Note ALARP (N-04300-GN0166, August 2022)
- NOPSEMA Guidance Note Control Measures and Performance Standards (N04300-GN0271, Revision 26 June 2020)
- NOPSEMA Guideline Environment Plan Decision Making (N-04750-GL1721, January 2024)
- NOPSEMA Guidance Note Risk Assessment (GN0165, June 2020)
- NOPSEMA Oil Pollution Risk Management (GN1488, July 2021).

Overview

The ALARP Assessment Framework uses activity-specific information to systematically assess existing and potential control measures and ensure that all practicable control measures are identified and documented.

When selecting controls to reduce risk is it good practice to apply a preferential order; elimination, substitution, prevention, reduction and mitigation. In the context of this ALARP Assessment Framework for oil spill response, all control measures are response strategies to reduce the impacts of an unplanned event that has already occurred. All source control response measures may be classed as ‘reduction’ in the hierarchy of controls with all other response measures classed as ‘mitigation’.

The ALARP Assessment Framework is shown in Figure B-1.

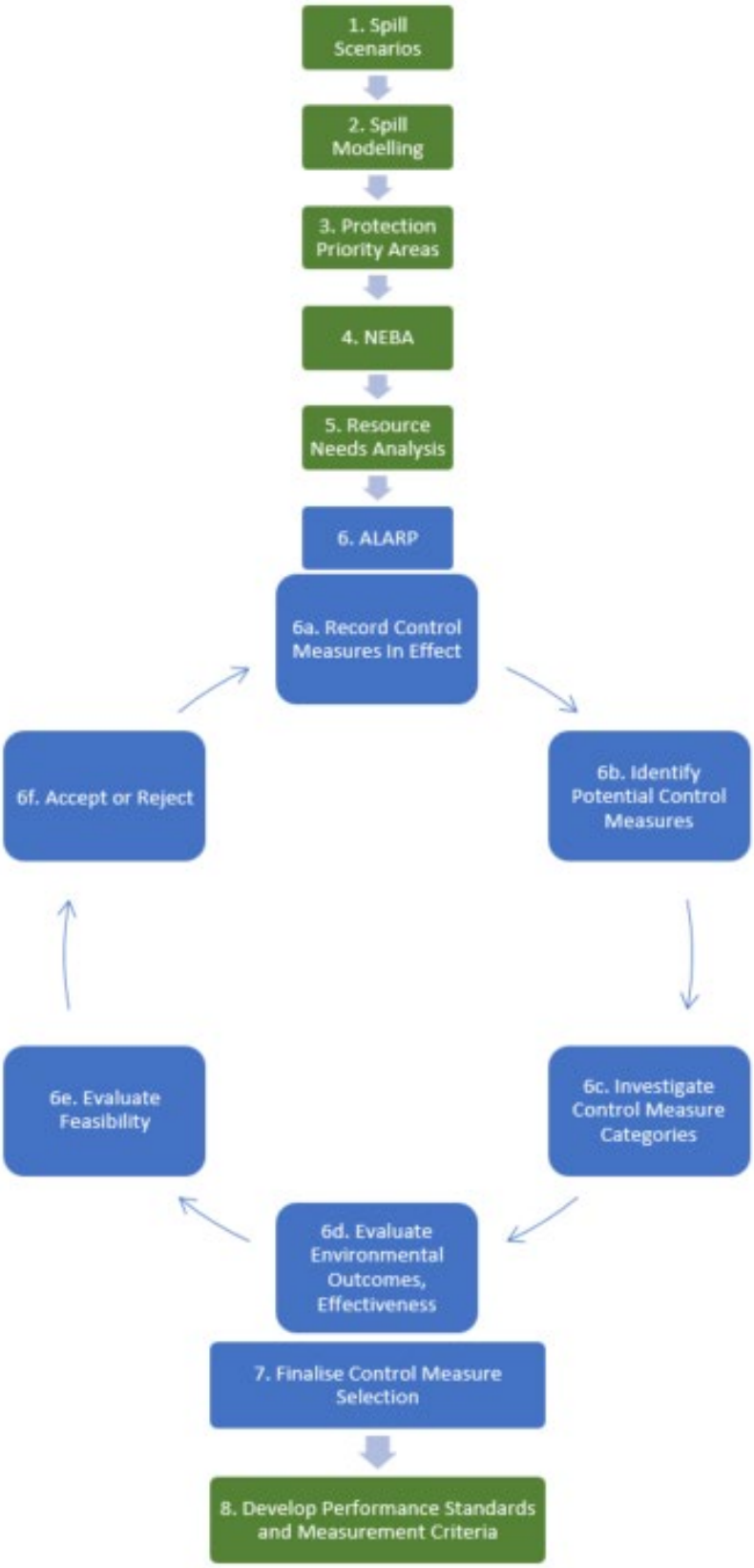


Figure B-1: ALARP Assessment Framework

In Figure B-1, Steps 1 to 5 (in GREEN) denote input information into the ALARP Assessment Framework. This information comprises:

1. **Spill Scenarios**: This step will involve assessing all possible spill scenarios from the activity and identifying the worst-case credible scenarios as a basis for pollution response planning.
2. **Spill Modelling**: A quantitative spill modelling assessment is conducted for the worst-case credible scenarios identified in Step 1.

3. **Protection Priority Areas**: The Environment that may be Affected (EMBA) is the largest area within which impacts from hydrocarbon spills associated with the activity could extend. The EMBA is predicted using spill modelling results from Step 2. Protection Priority Areas (PPA) are locations of high ecological value within the EMBA that would be targeted in response. Selection of PPAs is detailed in the Oil Spill Risk Assessment and Response Planning Procedure (SO-91-II-20003).
4. **NEBA**: Net Environmental Benefit Analysis (NEBA) is used to select the most effective response strategies to protect the PPAs identified in Step 3.
5. **Resource Needs Analysis**: For the response strategies identified through NEBA, the worst-case resource, timing and location requirements are determined using quantitative spill modelling information where applicable. Implementation Guidance is then developed to detail what arrangements and actions are required to be initiated by the Incident Management Team (IMT) to meet the incident requirements up to a worst-case incident.

Through the development of the Implementation Guidance it may be possible to identify resource, timing and location requirements that could be improved. These areas of improvement should be noted in the ALARP so that additional, alternative or improved control measures can be considered in this context.

A detailed ALARP Assessment Framework for the evaluation of control measures is shown in Figure B-1, Step 6 (in BLUE). Criteria and definitions used to evaluate control measures are shown in Table B-1.

- Record Control Measures In Effect: The spill response control measures currently in place for Santos are listed here. The environmental outcomes and effectiveness of the in-effect control measures are noted using the Resource Needs Analysis to assess whether there are any areas of improvement. Environmental outcomes include potential harmful effects of control measures.
- Identify Potential Additional Control Measures: Potential control measures are identified with a focus on any control measures that address areas of improvement identified in Step 6a.
- Investigate Control Measure Categories: In-effect and potential control measures from Steps 6a and 6b are classified as either additional, alternative or improved, and as either people, system, equipment or procedures. This step serves as a prompt to ensure that potential control measures from all categories are explored.
- Evaluate Environmental Outcomes and Effectiveness: The environmental outcomes and effectiveness are assessed for all control measures identified and described through Steps 6a, b, and c.
- Evaluate Feasibility: Time, cost and effort required for implementation are assessed for all control measures identified and described through Steps 6a, b, and c.
- Accept or Reject: The potential control measure will be accepted or rejected on the basis of environmental outcomes and effectiveness described in Step 6d and whether cost is grossly disproportionate, as described in Step 6e.

When evaluating potential control measures, implementation plans of in-effect control measures are carefully considered to ensure that any accepted control measures will equal or improve Santos' capacity to meet resource needs. Potential control measures are also considered within the context of Santos' current response arrangements to determine if synergies or resource conflicts might occur.

As control measures are evaluated for selection or rejection, they can be compared with industry good practice to ensure that all practicable control measures were implemented. Where unique circumstances exist and further analysis is required, a different evaluation technique may be used, such as technical analysis, detailed cost benefit analysis or combination of approaches.

New information on risks, impacts and response strategies obtained through analysis of operations, exercises and scheduled documentation reviews can be incorporated into the ALARP Assessment Framework cycle in a process of continual improvement.

In Figure B-1, Steps 7 and 8 show the conclusion of the ALARP Assessment Framework:

7. Finalised Control Measure Selection: Outputs from the ALARP Assessment shown in Step 6 comprise finalised control measures (in BLUE).
8. Develop Performance Standards and Measurement Criteria: For each control measure finalised in Step 7, performance standards and measurement criteria are then developed and documented in the OPEP (in GREEN).

Performance standards for all accepted control measures should be written to enable the operator to measure, monitor and test effectiveness. Only the key aspects of any given control will require performance standards and these may include the various measures of effectiveness; functionality, availability, reliability, survivability, dependency and compatibility. Parameters set in the performance standard should be 'SMART'; specific, measurable, appropriate, realistic and timely.

Corrective action based on deviations or trends in performance should be taken by amending either the performance standard or the control measure, as appropriate.

Criteria and definitions

Standardised criteria and definitions are used to bring consistency to the ALARP assessment across diverse activities and response strategies. Criteria and definitions are shown in Table B-1.

Table B-1: Criteria and definitions of ALARP Assessment Framework

Column	Description
Strategy	Response Strategy
Control Measure	Aspect of Response Strategy being evaluated Description of the control measure that is In Effect or description of the potential control measure
In Effect, Alternative, Additional, Improved	In Effect control measures are already in place. Alternative control measures are evaluated as replacements for the control already in effect. Additional control measures are evaluated in terms of their ability to reduce an impact or risk when added to the existing suite of control measures. Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures. Adapted from NOPSEMA Guideline Environment Plan Decision Making N 04750-GL1721 January 2024.
Control Measure Category	A range of different types of controls generally provide effective protection as they provide independence and multiple layers of protection. The OPGGS(S) Regulations refer to technical and 'other' controls where technical control measures involve hardware like shutdown valves and alarms. 'Other' control measures include administrative and procedural control measures such as inductions, a drug and alcohol policy or an inspection regime. Industry practice has further developed this concept of a range of different types of controls based on a POiSTED framework to assess organisational capability: • People – personnel • System – organisation, information/communications, support facilities, training/ competency • Equipment – equipment • Procedures – doctrine Santos aims to implement a range of different types of controls where possible.
Environmental Outcomes	Assessment of environmental benefits, particularly those over and above those environmental benefits documented in the Control Measure that is in effect. Environmental impacts of the Control Measure are also considered here.
Effectiveness	The effectiveness of a Control Measure in reducing the risk to ALARP is evaluated using the following six criteria. **Functionality** • The functional performance of a control measure is what it is required to do. How does the control perform in order to achieve the required risk reduction? **Availability** • Probability that the control measure will be available when required and has not failed or is undergoing a maintenance or repair. **Reliability** • The reliability of a control measure is the probability that at any point in time it will operate correctly for a further specified length of time. Reliability is all to do with the probability that the system will function correctly and is usually measured by the mean time between failure. **Survivability** • Whether or not a control measure is able to survive a potentially damaging event such as fire or explosion is relevant for all control measures that are required to function after an incident has occurred. • To achieve their purpose, oil spill response control measures should have high survivability. However, some control measures, such as those involving equipment deployment from an FPSO would have low survivability in an incident that involves an FPSO explosion or fire. **Dependency** • The dependency of the control measure is its degree of reliance on other systems in order for it to be able to perform its intended function. If several control measures can be disabled by one failure mechanism (common mode failure), or the failure of one control measure is likely to cause the

Column	Description
	failure of others, then the control measures are not independent, and it may not be appropriate to count such measures as separate. • Several control measures are reliant on equipment, people and vessels, hence have high dependence. **Compatibility** • Whether or not a control measure is compatible takes into account how alternative control measures may interact with other controls and the rest of the facility, if introduced. Consideration should be given to whether new control measures are compatible with the facility and any other control measures already in use. Adapted from NOPSEMA Guidance Note Control Measures and Performance Standards N04300-GN0271 Revision No 4 June 2020.
Feasibility	Feasibility describes the time, cost and/or effort required to implement the Control Measure.
Accept/Reject	Outcome of assessment and key reasons for the decision

ALARP assessment summaries

ALARP assessment summary
Source Control
The Control Measures in place for relief well drilling represent industry best practice and are considered to reduce the timeframe for drilling a relief well to as low as reasonably practicable in the context of the risk of an uncontrolled well leak during the cessation of production phase and floating asset removal activities. Potential Control Measures were identified and assessed by the Santos Drilling & Completions Department representatives. The drilling of a relief well is considered to be an effective control and relief well planning conducted in the area has demonstrated that a MODU will be on site for relief well drilling by day 47 from the start of a well release. Relief well drilling can be completed within 91 days (13 weeks) using MODUs, equipment and specialist personnel that Santos has arrangements to gain access to. One additional Control Measure was identified and assessed, which was rejected as grossly disproportionate. The rejected control measure was: • Contract source control personnel through a provider in addition to existing arrangements Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in Table 9-6. The key performance requirements for relief well drilling are the maintenance, tracking, access and relief well planning arrangements (during times of maintaining preparedness) and the timely mobilisation of resources (during a response). These key areas of effectiveness are reflected in the Performance Standards.
Monitor and evaluate
For the monitor and evaluate strategy, various, independent inputs from multiple service providers are used to build a detailed Common Operating Picture (COP) during the incident. Three additional or alternative Control Measures were identified and all were assessed and rejected as being grossly disproportionate: • Purchase of oil spill modelling system and internal personnel trained to use system • Purchase additional satellite tracking buoys • Ensure trained aerial observers based at strategic locations such as Exmouth, Port Hedland and Karratha Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in Table 10-21. The key areas of effectiveness for the identified Control Measures, during times of preparedness, focus on maintaining access to equipment and personnel through contractual arrangements with vessel providers, aircraft providers, aerial observers, UAV providers, tracking buoys, oil spill trajectory modelling providers and satellite imagery providers.
Mechanical dispersion
Mechanical dispersion is a secondary strategy that could be undertaken by vessels undertaking primary response strategies without the requirement for additional equipment. The use of mechanical dispersion as a response strategy would be assessed as part of an operational NEBA. No alternative, additional or improved Control Measures were identified and assessed. Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in Table 11-4. The key areas of effectiveness for the identified Control Measures during a response relate to the development of an operational NEBA to confirm suitability and environmental benefit of mechanical dispersion and the mobilisation of vessels. These key areas of effectiveness are reflected in the Performance Standards.

ALARP assessment summary

Surface Dispersant

Vessel based dispersant spray systems are available from Santos AMOSC and AMSA in the region (including stockpiles at Exmouth) and within WA. These spray systems are not considered a limiting factor to surface dispersant operations; the quantity of equipment available to WA through contractual arrangements and the positioning of equipment in first strike locations is considered adequate for the scale of worst-case surface dispersant operations identified in the OPEP. The timely mobilisation of suitable vessels and personnel required for surface dispersant operations are considered to be the key constraints for this strategy. A review of control measures associated with personnel and vessels identified that no further improvement could be made with respect to the identification of suitable surface dispersant vessels or to the availability of personnel without the cost/effort being disproportional to the risk.

Aerial based dispersant application is available to Santos through national and international resources via contractual arrangements. Mobilisation times for these resources are considered to be in line with industry best practice. No additional potential Control Measures were identified that could improve mobilisation times for aerial dispersant application. Dispersant volumes available within WA, Australia and internationally and the mobilisation of these stocks exceed worse case requirements, hence dispersant is not a limiting factor to the operation.

Seven alternate, additional or improved potential Control Measures were identified and assessed.

None were accepted as reasonably practicable.

Seven alternate, additional or improved Control Measures identified and assessed, however all were rejected as grossly disproportionate. Rejected Control Measures were:

- Access to additional spray systems stored in Karratha, Exmouth or Dampier
- Access to additional spray systems with dispersant stored on vessels
- Access to additional vessels by contracting vessels to remain on standby for chemical dispersion
- Faster access to response personnel via Santos employment of local personnel in locations such as Karratha or Exmouth
- Santos to contract personnel from Exmouth freight and logistics to deploy and operate vessel spray systems
- Access to aircraft via additional service provider
- Access to additional dispersant stockpiles owned by Santos

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the Table 12-10. The key areas of effectiveness for the identified Control Measures during times of preparedness, are around the maintenance of contracts for the vessel based and aerial dispersant application resources, dispersants and deployment personnel and the tracking of suitable vessels. In the event of a response, the key areas for ensuring effectiveness are the mobilisation of requirements to commence surface dispersant operations and evaluating dispersant efficacy using test sprays and operational monitoring. Information on dispersant efficacy then feeds into the development of the operational NEBA. These key areas of effectiveness are reflected in the performance standards.

Offshore Containment and Recovery

Not suitable for MDO given its rapid weathering nature and strong tendency to entrain into the upper water column in the presence of moderate winds (i.e. >12 knots). MDO will evaporate and spread quickly to a thin film, making recovery via skimmers difficult and ineffective.

Although stochastic results from oil spill modelling also indicated there was no probability of floating oil exceeding 50 g/m^2 for the LOWC scenario with Van Gogh Crude, containment and recovery has been selected as a secondary strategy for the LOWC scenario in case there are areas observed at suitable thickness in the event of a spill.

Santos, AMOSC and AMSA equipment is available in the northwest region and within WA (including stockpiles at Karratha and Exmouth) which includes offshore rated boom and skimmers suitable for application in response to a potential crude oil spill. Containment and recovery equipment availability is not considered a limiting factor to containment and recovery operations for this activity; the quantity of equipment available to Santos through contractual arrangements and the positioning of equipment in first strike locations is considered adequate for the scale of worst-case containment and recovery operations identified in the OPEP. The timely mobilisation of suitable vessels and personnel required for containment and recovery operations are considered to be the key constraints for this strategy.

A review of Control Measures associated with personnel and vessels identified that improvement could be made with respect to the identification of suitable containment and recovery vessels (through development of a vessel specification) but no improvements could be made to the availability of personnel or vessels (above current arrangements) without the cost/effort being disproportional to the risk.

Five additional or alternative Control Measures were identified and assessed.

No additional Control Measures were accepted as reasonably practicable.

Five additional/alternative Control Measures were rejected as grossly disproportionate. Rejected Control Measures were:

- Purchase additional booms and ancillary equipment to be owned by Santos
- Access to additional vessels by contracting vessels to remain on standby for containment and recovery
- Train additional Santos personnel for spill response teams
- Contract for staff from an alternative oil spill personnel provider
- Just-In-Time training to train personnel for containment and recovery operations

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in Table 13-6. The key areas of effectiveness for the identified Control Measures, during times of

ALARP assessment summary
preparedness, are around maintaining access to suitable vessels, equipment and personnel through contractual arrangements and the tracking of suitable vessels. During response, a key area for increasing effectiveness is the rapid mobilisation of first strike resources so that operations can be undertaken when oil concentration is at its highest. Given effectiveness of this strategy increases with oil concentration and decreases under high wind/sea state conditions, the consideration of these factors within an operational NEBA (SIMA) is considered a key control for maintaining effectiveness as well as the use of aerial surveillance to direct operations to areas of highest oil concentration. Waste storage may be a limiting factor for ongoing containment and recovery operations, so a key area for increasing effectiveness will be the application for approval for decanting wastewater from liquid oil waste storage tanks onboard vessels. These key areas of effectiveness have been represented in Performance Standards for containment and recovery operations.
Shoreline protection and deflection
Large quantities of various types of nearshore booms and skimmers from Exmouth, Dampier, VI, Fremantle and Broome ensures that equipment is in place to implement this response strategy within 24-72 hrs in a wide range of metocean conditions. Trained regional Santos personnel can be quickly mobilised to appropriate locations using helo services, followed by AMOSC staff and AMOSC Core Group. These regional and state resources ensure that equipment and personnel are not a limiting factor in this response strategy. Three additional or improved Control Measures were identified and evaluated, however were rejected as grossly disproportionate to the reduction in risk: • Santos to purchase additional shoreline and nearshore booms and ancillary equipment • Access to additional shallow draft boom tow vessels owned by Santos • Ensure trained personnel based at strategic locations such as Dampier, Port Hedland, Karratha, Exmouth or Broome Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in Table 14-6. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to equipment and personnel through contractual arrangements. During response, a key area for ensuring effectiveness is the mobilisation of requirements in order to commence protection and deflection operations and the preparation of an operational NEBA for each operational period that takes into account protection priorities and the ongoing effectiveness of the response strategy. These key areas of effectiveness have been represented in Performance Standards for protection and deflection operations.
Shoreline clean-up
Regional and Fremantle stockpiles and locally available supplies provide a range of shoreline clean-up equipment that can be accessed to suit most beach types / required clean-up operations. Trained regional Santos personnel can be quickly mobilised to appropriate locations using helo. services or vessels, followed by AMOSC staff and AMOSC Core Group. Equipment and trained personnel are not expected to be limiting factors for this response strategy. The availability of labour hire personnel for initial stages of a response was identified as an area of improvement. Control Measures that were evaluated to improve the availability of labour hire were either not feasible or the cost was grossly disproportionate to the reduction in risk. Seven additional or improved Control Measures were identified, evaluated and rejected as grossly disproportionate: • Mechanical mobile plant equipment for clean-up pre purchased and positioned at strategic locations (Exmouth) • Prepurchase and storage of equipment (decontamination/ staging equipment, clean-up and flushing, PPE) at strategic locations (Exmouth) • Access to additional shallow draft vessels owned by Santos WA to transport personnel to key sensitive areas on offshore islands • Access to additional team leaders that are locally based at strategic locations (Dampier) or can be mobilised within short time frames • Faster access to clean-up personnel via Perth based labour hire contractor • Faster access to clean-up personnel via locally based labour hire companies or emergency response organisations • Faster access to clean-up personnel via Santos employment of local personnel Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in Table 15-5. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to suitable equipment and personnel through contractual arrangements. During response, a key area of effectiveness is the rapid mobilisation of equipment and personnel and preparation of a Shoreline Clean-up Subplan and NEBA to ensure that impacts from response activities are minimised and operations are conducted in accordance with protection priorities as confirmed by the Control Agency.
Oiled wildlife
Oiled wildlife equipment including first strike kits and containers can be mobilised from regional locations and Perth. Further equipment is available through national or international resources to implement a timely and sustained response adequate for the scale of worst-case oiled wildlife operations identified in the OPEP. The availability of trained personnel in the initial stages of an incident is a limiting factor for this response strategy. Control Measures around the provision of trained personnel were reviewed to identify that trained Santos personnel could be based not just in the Perth Office but also at Varanus Island and Devil Creek facilities. Potential Control Measures around additional responders through pre-hiring or contracts with additional service providers were investigated but were found to be not beneficial and/or the cost was grossly disproportionate to risk reduction.

ALARP assessment summary
Two additional or alternative Control Measures were identified but were rejected as grossly disproportionate. Rejected control measures were: • Pre-hire and/or prepositioning of staging areas and responders • Direct contracts with service providers Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in Table 16-7. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to equipment and personnel through contractual arrangements. During response, the mobilisation of requirements for initial oiled wildlife response operations and the management of the oiled wildlife response in accordance with the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) are both key elements for achieving this strategy and they are represented as a Performance Standard.
Operational and Scientific monitoring
Oil spill operational and scientific monitoring will be conducted on behalf of Santos by contracted OSM Service Provider, via the OSM Supplementary Services Agreement, as detailed in North West Shelf OSM-BIP (7715-650-ERP-0002) Three additional, alternative or improved potential Control Measures were identified but rejected as grossly disproportionate: • Monitoring personnel and equipment on standby in Dampier; • Ensure trained monitoring specialists are available on site; • Ensure trained marine mammal/fauna observers based at strategic locations such as Port Hedland, Karratha and Broome. Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in Table 17-2. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to equipment and personnel through contractual arrangements, regular reviews of OSM service provider capability and reviews of existing baseline data. During response, a key area for effectiveness is the mobilisation requirements to commence operational and scientific monitoring, and ensuring that relevant operational and scientific monitoring plans are followed.
Waste Management
The Santos contract with a waste service provider has provisions for waste management operations of the scale estimated to be required in worst case scenarios detailed in the OPEP. Further detail is captured in the Waste Management Plan - Oil Spill Response Support (7715-650-ERP-0001). The waste service provider can mobilise waste receptacles from Karratha within 24 hours. Given the waste service provider arrangements and pre-planning already undertaken, waste storage facilities, road transport and logistics are not expected to be limiting factors in the response. Areas of improvement were identified regarding the availability of vessels required for waste transport at sea and additional storage tanks. Four additional, alternative or improved potential Control Measures were identified and assessed to reduce these risks, one of which was accepted and the other three rejected due to the cost being grossly disproportionate to risk. Four additional Control Measures were identified and assessed. One additional Control Measures was accepted as reasonably practicable: • Monitoring and hire of additional vessels located in the region, tracked via the WA Vessel Monitoring System (IHS Maritime Portal), and contracted at the time of incident Three additional Control Measures were rejected as grossly disproportionate. Rejected control measures were: • Maintain contracts with multiple service waste providers • Procure temporary waste storage for Santos stockpile • Contract additional vessels on standby for waste transport Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in Table 18-4. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are regarding maintaining access to waste management equipment and services through contractual arrangements. During response, a key area for increasing effectiveness is the timely mobilisation of requirements for initial response operations and defining critical management and reporting services to be provided by the waste service provider. These key areas of effectiveness are captured in the Performance Standards.

Appendix C Pollution report

Government of **Western Australia**
Department of **Transport**

Marine Pollution Report (POLREP)
MEER

When blank, this form is classed as **OFFICIAL**, when filled out, this form is classed as **OFFICIAL-SENSITIVE.**

BEFORE completing this form please contact the MEER duty officer on (08) 9480 9924 (24hrs). Immediate reporting will enable a rapid response.

Return completed form to:
Maritime Environmental Emergency Response
Department of Transport
Email: marine.pollution@transport.wa.gov.au and rccaus@amsa.gov.au
Phone (08) 9480 9924

INCIDENT DESCRIPTION

Incident Name: _____ Date and Time of Incident (24 hr format): _____

Location name/description: _____

Incident Coordinates: Latitude of spill _____ Longitude of spill _____

Description of Incident: _____

Weather conditions at site: _____

OIL DETAILS

Pollutant source

Amount of fuel/pollutant on board: _____

☐ Vessel ☐ Land (Specify) _____ ☐ Other (Specify) _____ ☐ Unknown

Vessel type (if known) ☐ Tanker ☐ Container ☐ Bulk ☐ Cargo

☐ Fishing ☐ Defence ☐ Recreational ☐ Other (Specify) _____

Vessel name: _____ Flag State / Callsign: _____ Australian vessel? ☐ Yes ☐ No

Pollutant

☐ Oil (type) ☐ Bilge ☐ Diesel ☐ HFO bunker ☐ Crude ☐ Unknown ☐ Other (Specify)_____

☐ Chemical Name: _____ MARPOL cat / UN Nos:_____

☐ Garbage Details/description: _____

☐ Packaged Details/description: _____

☐ Sewage Details/description: _____

☐ Other Details/description: _____

Extent

Size of spill (length & width in metres): _____

Amount of pollutant spilt, if known (litres): _____

Has the discharge stopped? ☐ Yes ☐ No ☐ Unknown

☐ Photos taken Details: _____ held by:_____

☐ Video taken Details: _____ held by:_____

☐ Samples taken Description: _____ held by:_____

☐ Items retrieved Description: _____ held by:_____

To attach photos, this form must be opened in acrobat, or alternatively, photos can be attached to the submission email before sending.

ADDITIONAL INFORMATION

Response action undertaken? ☐ Yes ☐ No If yes, provide details below, please include any environmental impact.

Equipment used? ☐ AMSA ☐ State ☐ Industry

Is assistance for an investigation required from DoT ☐ Yes ☐ No

KEY CONTACT DETAILS

Name:_____ Position: _____ Phone: _____

Control Agency: Select the Control Agency _____ Jurisdictional Authority: Select the Jurisdictional Authority _____

PRIVACY STATEMENT

The Department of Transport is collecting the information on this form to enable it to carry out its role as Jurisdictional Authority as per State Hazard Plan - Maritime Environmental Emergency.
The Department of Transport and/or AMSA may give some or all of this information to other government bodies, non-government organisations who have responsibilities under the National Plan, and law enforcement agencies.

Pollution Report (POLREP)		
Reporter's Signature:		
Name:	Agency:	Role:

Once you have completed the form please check that all relevant fields have been filled with accurate data.
Please email completed form to marine.pollution@transport.wa.gov.au

Appendix D Situation report

Government of **Western Australia**
Department of **Transport**

Maritime Environmental Emergency Situation Report (SITREP)
MEER

When blank, this form is classed as **OFFICIAL**, when filled out, this form is classed as **OFFICIAL-SENSITIVE.**

Return completed form to:
Maritime Environmental Emergency Response
Department of Transport
Email: marine.pollution@transport.wa.gov.au and rccaus@amsa.gov.au
Phone (08) 9480 9924

MARITIME ENVIRONMENTAL EMERGENCY SITUATION REPORT (SITREP)

This is advice from the Control Agency of the current status of the incident and the response.
This form is transmitted to all relevant agencies including:

- Jurisdictional Authority
- Support Agencies

INCIDENT DESCRIPTION

Incident Name: _____ Ref. No. _____

Incident Controller: _____

Incident Declaration Level: Please select _____ Controlling Agency: Please select _____

Priority ☐ Urgent ☐ Immediate ☐ Standard

Final SITREP? ☐ Yes ☐ No

Next SITREP on: _____

Date and Time of Incident (24 hr format): _____

POLREP or AMSA Form 18 Reference : _____

Incident location: _____ Latitude: _____ Longitude: _____

Brief description of incident and impact: _____

Overall weather conditions: _____

Summary of response actions to date: _____

Current Strategies: _____

Summary of resources available/deployed:_____

Expected developments: _____

Other Information:_____

Maritime Environmental Emergency Situation Report (SITREP)		
Reporter's Signature:		
Name:	**Agency:**	**Role:**

Once you have completed the form please check that all relevant fields have been filled with accurate data.
Please email completed form to marine.pollution@transport.wa.gov.au

Appendix E Vessel surveillance observer log

Vessel Surveillance Observer Log – Oil Spill

Survey Details			
Date	Start time:	End Time:	Observers:
Incident:			Area of Survey:
Vessel:			Master:

Weather Conditions	
Wind speed (knots):	Wind direction:
Time high water and height (LAT):	Current direction:
Time low water and height (LAT):	Current speed (nM):
Tide during observations:	Sea state:
Stage of tide during observations (incoming/falling):	Other weather observations:

Slick Details											
Slick grid parameters by lat/long:					Slick grid parameters (vessel speed)			Slick grid dimensions: N/A			
Length Axis:		Width Axis:			Length Axis: N/A			Width Axis	Length		nm
Start Latitude		Start Latitude			Time (seconds)			Time (seconds)	Width		nm
Start Longitude		Start Longitude							Length		nm
End Latitude		End Latitude			Speed (knots)			Speed (knots)	Width		nm
End Longitude		End Longitude							Grid area		km^2
Code	Colour	%age cover observed	Total grid area		Area per oil code			Factor	Oil volume		
1	Silver			km^2		km^2		40-300 L/ km^2		L	
2	Iridescent (rainbow)			km^2		km^2		300-5,000 L/ km^2		L	
3	Discontinuous true oil colour (Brown to black)			km^2		km^2		5,000-50,000L/ km^2		L	
4	Continuous true oil colour (Brown to black)			km^2		km^2		50,000 – 200,000 L/ km^2		L	
5	Brown / orange			km^2		km^2		>200,000 L/ km^2		L	

Timeline of observations:

Time	Description

Appendix F Aerial surveillance observer log

Santos

Aerial Surveillance Observer Log – Oil Spill

Survey Details				
Date:	Start time:	End Time:	Observer/s:	
Incident:			Area of Survey:	
Aircraft type:	Call sign:		Average Altitude:	Remote sensing used:

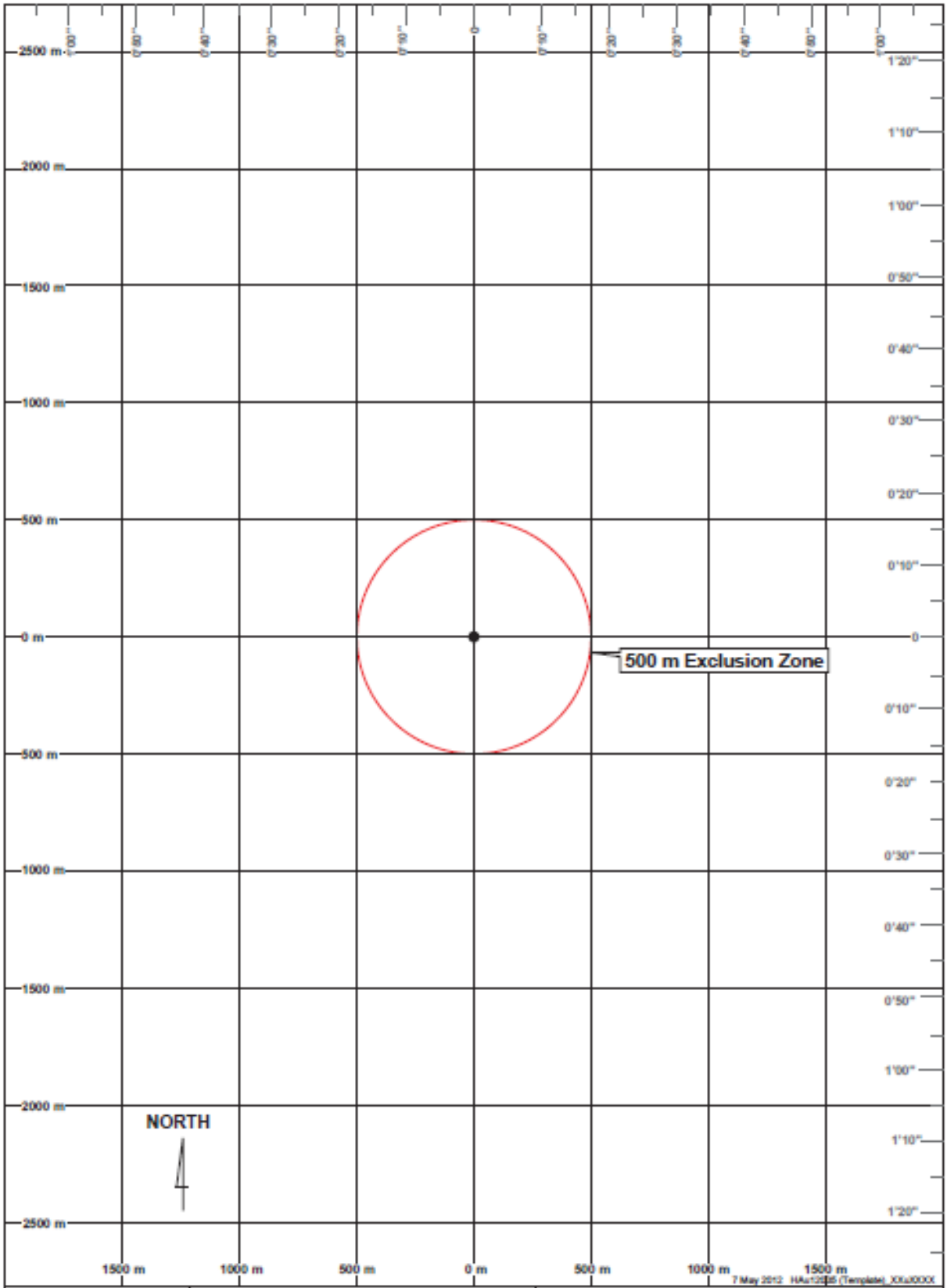
Weather Conditions	
Wind speed (knots)	Wind direction
Cloud base (feet)	Visibility
Time high water	Current direction
Time low water	Current speed (nM)

Slick Details											
Slick grid parameters (lat/long)				Slick grid parameters (air speed)		Slick grid dimensions					
Length Axis		Width Axis		Length Axis		Width Axis	Length	nm			
Start Latitude		Start Latitude		Time (seconds)		Time (seconds)	Width	nm			
Start Longitude		Start Longitude					Length	nm			
End Latitude		End Latitude		Air Speed (knots)		Air Speed (knots)	Width	nm			
End Longitude		End Longitude					Grid area	km^2			

Code	**Colour**	**% cover observed**	**Total grid area**		**Area per oil code**		**Factor**	**Oil volume**	
1	Silver			km^2		km^2	40-300 L/ km^2		L
2	Iridescent (rainbow)			km^2		km^2	300-5,000 L/ km^2		L
3	Discontinuous true oil colour (Brown to black)			km^2		km^2	5,000-50,000L/ km^2		L
4	Continuous true oil colour (Brown to black)			km^2		km^2	50,000 – 200,000 L/ km^2		L
5	Brown / orange			km^2		km^2	>200,000 L/ km^2		L

Appendix G Aerial surveillance surface slick monitoring template

AERIAL SURVEILLANCE SURFACE SLICK MONITORING TEMPLATE



	NAME:	VESSEL / AIRCRAFT:
	DATE / HOUR:	OTHER REFERENCE:

Appendix H Aerial surveillance marine fauna sighting record

Santos

OIL SPILL SURVIELLANCE - MARINE FAUNA SIGHTING RECORD SHEET

Date:		**Time:**	
Latitude:		**Longitude:**	

MARINE FAUNA ID GUIDE

○ Humpback whale

○ Blue whale

○ Minke whale

○ Sperm whale

○ Killer whale

○ Bryde's whale

○ Whale species unknown

○ Whale shark

○ Dugong

○ Hawksbill turtle

○ Loggerhead turtle

○ Green turtle

○ Flatback turtle

○ Bottlenose dolphin

○ Spinner dolphin

○ Dolphin species unknown

○ Leatherback turtle

○ Turtle species unknown

FAUNA DETAILS					
Category	**Type/species?** **Adult/juvenile?** **ID confidence?**	**Number**	**Date/Time**	**Photo/ video taken?** **Reference No.**	**Behaviour / Comments.** **Proximity to oil? Oiled?** **Milling? Feeding? Transiting?**
Cetaceans (Whales/ Dolphins)					
Turtles					
Birds					
Dugongs					
Sharks					
Other					

Other details for each observation location

WEATHER DETAILS

Sea State ◯ Mirror calm ◯ Small waves ◯ Slight ripples ◯ Large waves some whitecaps ◯ Large waves, many whitecaps

Visibility ◯ Excellent ◯ Good ◯ Moderate ◯ Poor ◯ Very Poor

OBSERVER DETAILS

Observer Name	Observer signature	**Observer** ◯ Inexperienced ◯ Experienced

Appendix I Aerial surveillance shoreline observation log

Aerial Surveillance Reconnaissance Log – Oil Spill

Survey Details				
Incident:	Date:	Start time:	End Time:	Observer/s:

Area of Survey	
Start GPS LATITUDE: LONGITUDE:	End GPS LATITUDE: LONGITUDE:

Aircraft type	Call sign	Average Altitude	Remote sensing used (if any)

Weather Conditions		
Sun/Cloud/Rain/Windy	Visibility	Tide Height L/M/H
Time high water	Time low water	Other

Shoreline Type - Select only ONE primary (P) and ANY secondary (S) types present					
	Rocky Cliffs		Boulder and cobble beaches		Sheltered tidal flats
	Exposed artificial structures		Riprap		Mixed sand and gravel beaches
	Inter-tidal platforms		Exposed tidal flats		Fine-Medium sand grained beaches
	Mangroves		Sheltered rocky shores		Other
	Wetlands		Sheltered artificial structures		

Operational Features (tick appropriate box)					
	Direct backshore access		Alongshore access		Suitable backshore staging
Other					

Appendix J Shoreline clean-up equipment

Table J-1: Recommended equipment for an initial deployment of a 6-person shoreline clean-up team

Shore clean-up Tools	Quantity
Disposal Bag Labelled, 140 cm x50cm x 100µm	1,000
Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100µm	50
Polyethylene Safety Shovel 247mm z 978mm	2
Steel Shovel	4
Steel Rake	2
Landscapers Rake	2
Barrier Tape – “Caution Spill Area”	10
Pool scoop with extendable handle – flat solid	2
Poly Mop Handle	2
Safety Retractable Blade Knife	2
Poly Rope 20m	6
Star Pickets	24
Star Picket driver	1
Hand Cleaner	1
Cable ties – general use	1,000
Wheel Barrow	2
Galvanised Bucket	4
Pruning secateurs	2
Hedge Shears	1
Personal Protection Equipment (PPE) – Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Respirator dust/mist/fume and valve	40
Disposable box light nitrile gloves (100bx)	2
Alpha Tec gloves (assort size)	24
Ear Plugs (200bx)	1
Safety Glasses	18
Safety Goggles non vented	6
Gum Boots (assort size)	18
Rigger Gloves (assort size)	18
Day/Night Vest	6
Storage Equipment	
Collapsible Bund 1.6m x 1.2m	2
Collapsible bund 4m x 2.4m	1
Misc. sizes of ground sheets / tarps.	6
Absorbents	
Absorbent Roll ‘oil and fuel only’ 40m x 9m	6
Absorbent Pad “oil and fuel only” 45cm x 45cm	400
Poly Mops (snags)	150
Poly Absorbent Wipes	10
Additional Items	
Folding Deck Chair 6	6
Folding Table 1	1
Shelter open side 1	1
6 Person first aid kit 1	1
Wide Brim Hat with cord 6	6
Sunburn Cream 1 litre pump bottle 1	1
Personal Eyewash bottle 500mls 6	6
Personal Drink bottle 750mls 6	6
Boxes, Bin and Lid Storage/transport assorted	-
Optional items	
Inflatable tent 9 square metres	1

Table J-2: Recommended equipment list for a decontamination unit for a shoreline clean-up team

Shore clean-up Tools	Quantity
Inflatable Decon Tent	1
Inflatable Tent 9 square metres – Modesty or Control tent	1
Misc sizes of ground sheets/tarps	4
Collapsible Bund 1.6m x 1.2m (two stages)	2
2 stools in each bund	4
Collapsible Bund 4m x 2.4m (for used PPE and clothing into DB's)	1
Long Handled Scrub brush	2
Scrub Brush	2
Simple Green 20 ltr	2
Poly Absorbent Wipes	10
Wet Wipe Canister	6
Disposal Bag for Clothing, 140cm x 50cm x 100µm	100
Bath towel	6
Liquid soap in push dispenser (citrus based)	1
Track mat – Absorbent for Corridor/walkway	1
Star pickets	16
Star picket driver	1
Barrier tape to create corridors	4
Safety Goggles non vented (used during decon)	6
Additional items	
Folding Deck Chair	6
Folding Table	1
Shelter open side	1
6 Person first aid kit	1
Wide Brim Hat with cord	6
Sunburn Cream 1 litre pump bottle	1
Personal Eyewash bottle 500mls	6
Personal Drink bottle 750mls	6
Boxes, Bin and Lid Storage/transport assorted	-

Table J-3: Recommended equipment list for deployment of a 6-person team for shoreline flushing or recovery

Flushing Equipment	Quantity
Diesel self prime semi trash pump, 25-35 psi, 4.8hp	1
Perforated 2" lay flat hose, 20 m sections	2
Section Hose 2", 20m sections	5
Hose End Strainer	1
Recovery Equipment	
Tidal Boom (shoreline boom) 25m lengths	2 (50m)
Tidal Boom Accessories pack 1	1
Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section 2 (50m)	2 (50m)
Towing Bridle 2	2
Danforth Sand Anchor Kit, 30m lines, 15m trip lines 3	3
Diesel Powered pump with hose 1	1
Manta Ray skimmer 1	1
Personal Protection Equipment (PPE) – Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Respirator dust/mist/fume and valve	40
Disposable box light nitrile gloves (100 box)	2
Ear Plugs (200 box)	1
Safety Glasses	18
Gum Boots (assorted sizes)	18
Hyflex Oil Restraint Gloves (assorted sizes)	18
Day/Night Vest	6
Storage Equipment	
Collapsible Bund 1.6m x1.2m	1
Misc sizes of ground sheets/tarps	6
Collapsible Tank 5,000 litres	2
Absorbents	
Absorbent Boom 'oil and fuel only' 3 or 6m x 180,mm	200 m
Absorbent Roll 'oil and fuel only' 40m x 9m	10
Absorbent Pad "oil and fuel only" 45cm x 45cm	1,000
Poly Absorbent Wipes	10
Additional Items	
Folding Deck Chair	6
Folding Table	1
Shelter open side	1
6 Person first aid kit	1
Wide Brim Hat with cord	6
Sunburn Cream 1 litre pump bottle	1
Personal Eyewash bottle 500mls	6
Personal Drink bottle 750mls	6
Boxes, Bin and Lid Storage/transport assorted	-
Inflatable Tent 9 square metres	1

Table J-4: Recommended equipment list for a 6-person team for near shore clean-up

Absorbents	Quantity
Absorbent Roll ‘oil and fuel only’ 40m x 9m	20
Absorbent Pad “oil and fuel only” 45cm x 45cm	2,000
Absorbent Boom “oil and fuel only” 3or6m z 180mm	200 m
Poly Mops (snags)	150
Poly Absorbent Wipes	20
Recovery Equipment	
Tidal Boom (shoreline boom) 25m lengths	4 (100 m)
Tidal Boom Accessories pack	2
Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section	8 (200 m)
Towing Bridle	2
Danforth Sand Anchor Kit 15kg 30m lines, 15m trip lines	10
Weir Skimmer 30T hr	1
Trash Screen for above	1
Diesel Powered pump with hose	1
Manta Ray skimmer	1
Shore Clean-up Tools	
Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100µm	200
Pool scoop with extendable handle – flat solid	2
Poly Mop Handle	2
Poly Rope 20m	10
Star Pickets	24
Star Picket driver	1
Intrinsic Safe Torch	6
Hand Cleaner	1
Cable ties (to add extra join to absorbent booms)	150
Personal Protective Equipment (PPE) Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Disposable box light nitrile gloves (100 box)	2
Alpha Tec gloves (assorted sizes)	24
Ear Plugs (200bx)	1
Safety Glasses – with head strap	18
Gum Boots (worn extra large or as advised by skipper)	18
Steel cap waders	2
Personal Flotation Device	6
Rigger Gloves (assort size)	18
Storage equipment	
Collapsible Bund 1.6 m x 1.2 m	2
Collapsible bund 4 m x 2.4 m	1
Collapsible Tank 5,000 litres	2
Alum box, Bin & lid Storage/transport cases	10
Misc. sizes of ground sheets/tarps	6
Additional Items	
6 Person first aid kit 1	1
Wide Brim Hat with cord 6	6
Sunburn Cream 1 litre pump bottle 1	1
Personal Eyewash bottle 500mls 6	6
Personal Drink bottle 750mls 6	6

Appendix K Shoreline response strategy guidance

Guidance on response methods for sensitive coastal habitats is provided in Table K-1.

Guidance on applicable shoreline clean-up techniques based on shoreline substrate and degree of oiling are presented in Figure K-1 to Figure K-4.

Table K-1: Strategy Guidance for shoreline response at coastal sensitivities

Sensitive receptors	Strategy guidance
Mangroves	• All efforts should be mounted to prevent any oil from moving towards this area by using booms to divert the oil away from this area. • However, if oil is expected to move into this area, multiple rows of booms, or earthen booms can be deployed at the entrance of creeks or along the mangrove fringe to prevent/minimise oiling. • Sorbents can be used to wipe heavy oil coating from roots in areas of firm substrate. Close supervision of clean-up is required. • Where thick oil accumulations are not being naturally removed, low-pressure flushing may be attempted at the outer fringe – sorbent pads and sorbent sweeps can be used to recover the sheen. • No attempt should be made to clean interior mangroves, except where access to the oil is possible from terrestrial areas. • Oily debris should be removed; it is extremely important to prevent disturbance of the substrate by foot traffic; thus most activities should be conducted from boats. • Live vegetation should not be cut or otherwise removed.
Mudflats	• All efforts should be mounted to prevent any oil from moving towards this area by using booms to divert the oil away from this area. • However, if oil is expected to move into this area, multiple rows of booms, or earthen booms can be deployed at the entrance of channels filling/ draining mudflats. • Efforts to manually clean mudflats may result in further damage due to trampling of the oil into sediments which typically rich in biota and provide a food source for fish and birds. • Therefore, natural remediation may be the preferred approach and if removal is required, the flushing of oil into open water, if feasible, may be preferred to manual collection • The presence of wildlife (e.g. shorebirds) and sensitive flora (e.g. mangroves) which are often associated with mudflats needs to be considered in determining the best approach.
Sandy beaches	• Clean-up techniques will depend upon the degree of infiltration into sand or and degree of burial which will require surveying/mapping • Clean-up will also depend upon sensitivity of environment (existing ecological features), access to the beach and potential for additional erosion. • Oil and oiled sediments can be physically removed offsite, moved to surf zone for surf washing of sediment or assisted to move to water edge by ploughing of channels or flushing. • Recovery of oil can be by manual means (hand tools) or mechanical means (earth moving, pumping equipment). • The sensitivity of the environment is a key factor, with manual removal creating less waste and disturbance but more consuming in time and resources.
Seabirds, shorebirds and migratory waders	• All efforts should focus on deflecting oil away from this area or dispersing the oil offshore or using booms offshore to divert the oil away from this area. • If oil is expected to move into the coastal colonies and roosting areas, multiple booms can be deployed along the reserve to prevent/minimise oiling.
Turtle nesting beaches during or near nesting season	• All efforts should be mounted to prevent any oil from moving towards this area by using booms to divert the oil away from this area. • However, if oil is expected to move into this area, booms can be deployed along the reserve to prevent/minimise oiling.
Fringing coral reef communities	• Little can be done to protect coral reef beds along exposed sections of shoreline. • Floating oil would potentially coat living reef communities, which are usually slightly elevated and are consequently exposed at low tide.

Sensitive receptors	Strategy guidance
(Note: submerged coral reef communities are less susceptible to oiling)	• Natural recovery with a close monitoring program is the preferred clean-up technique. Clean-up of the reef itself by natural processes is expected to be rapid. • As much as practicable, oil should be removed from adjacent intertidal areas to prevent chronic exposure of the corals to oil leaching from these sites. • Use of sorbents should be limited to those that can be contained and recovered.
Macroalgal and seagrass beds	• All efforts should focus on deflecting oil away from this area, dispersing the oil offshore, or using booms to divert the oil away from this area. • Extreme care should be taken not to disturb the sediments during clean-up operations in the vicinity of macroalgal and seagrass beds, which could result in total loss of the macroalgal and seagrass beds. • Removal of oiled parts of the macroalgal and seagrass beds should only be considered when it can be demonstrated that special species are at significant risk of injury from contact or grazing on the macroalgal and seagrass beds. • Otherwise, the best strategy for oiled seaweed is to allow natural recovery.
Rocky coast	• Where practicable, booms can be deployed parallel to the rocky coasts to prevent/minimise oiling. • Flushing rocky shoreline is considered the most effective method of cleaning. Care must be taken to assess the fate and transport of the flushed oil and sorbent snares can be used to recover if deemed necessary to reduce impacts to ALARP. • For small areas of contamination, rocky structure can be manually wiped with sorbent pads or scraped to remove oil.

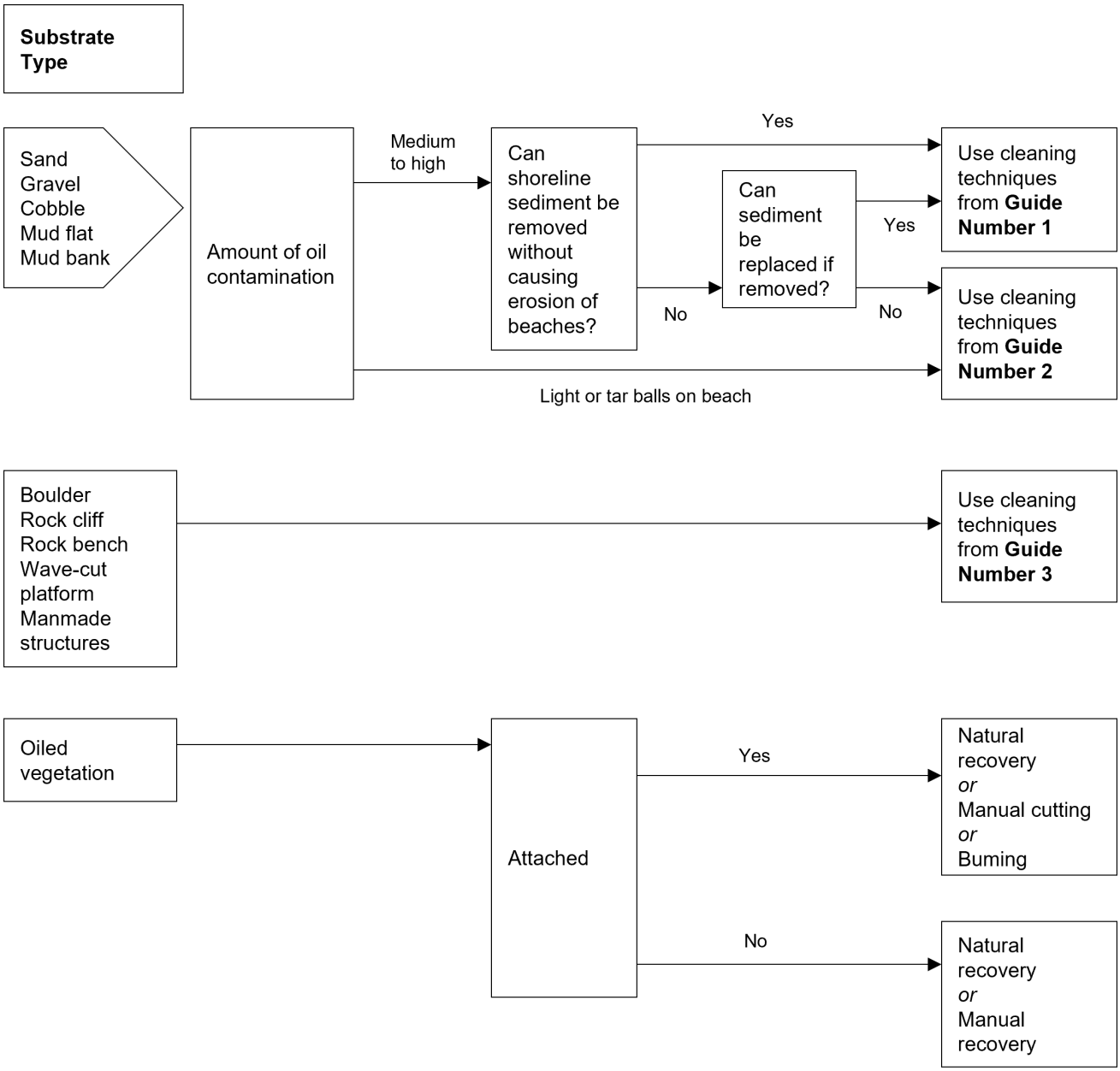


Figure K-1: Shoreline Clean-up Master Decision Guide

Trafficability		Substrate type	Depth of penetration	Clean-up techniques in order of preference	Access	
1. Can rubber-tyred equipment operate on beach?	→ Yes	Sand, Gravel. Mud	Less than 3 cm	Motor-grader and elevated scraper combination. Elevated Scraper, Motor-grader and Front-end loader (Rubber-tyred) combination.	**3. Is there access to beach for heavy equipment or can access be constructed?**	→ Yes ↓
			Greater than 3 cm	Elevated Scraper. Front-end loader (Rubber-tyred). Bulldozer and Front-end loader (Rubber-tyred) combination.		Select most preferable technique
		Cobble	Less than 30 cm	Front-end loader (Rubber-tyred).		
			Greater than 30 cm	Bulldozer and Front-end loader (Rubber-tyred) combination. Front-end loader (Rubber-tyred).		
		Mud bank	Not applicable	Backhoe. Front-end loader (Rubber-tyred).		
↓ No						
2. Can tracked equipment operate on beach?	→ Yes	Sand, Gravel, Mud, Cobble	Less than 30 cm	Front-end loader (Tracked). Bulldozer and Front-end loader (Tracked) combination.		
			Greater than 30 cm	Bulldozer and Front-end loader (Tracked) combination. Front-end loader (Tracked).		
↓ No					↓ No	
Use dragline or hydraulic grader or leave to natural recovery				Go to next Figure – Decision guide No. 2, Question 4.		

Figure K-2: Shoreline Clean-Up Decision Guide 1

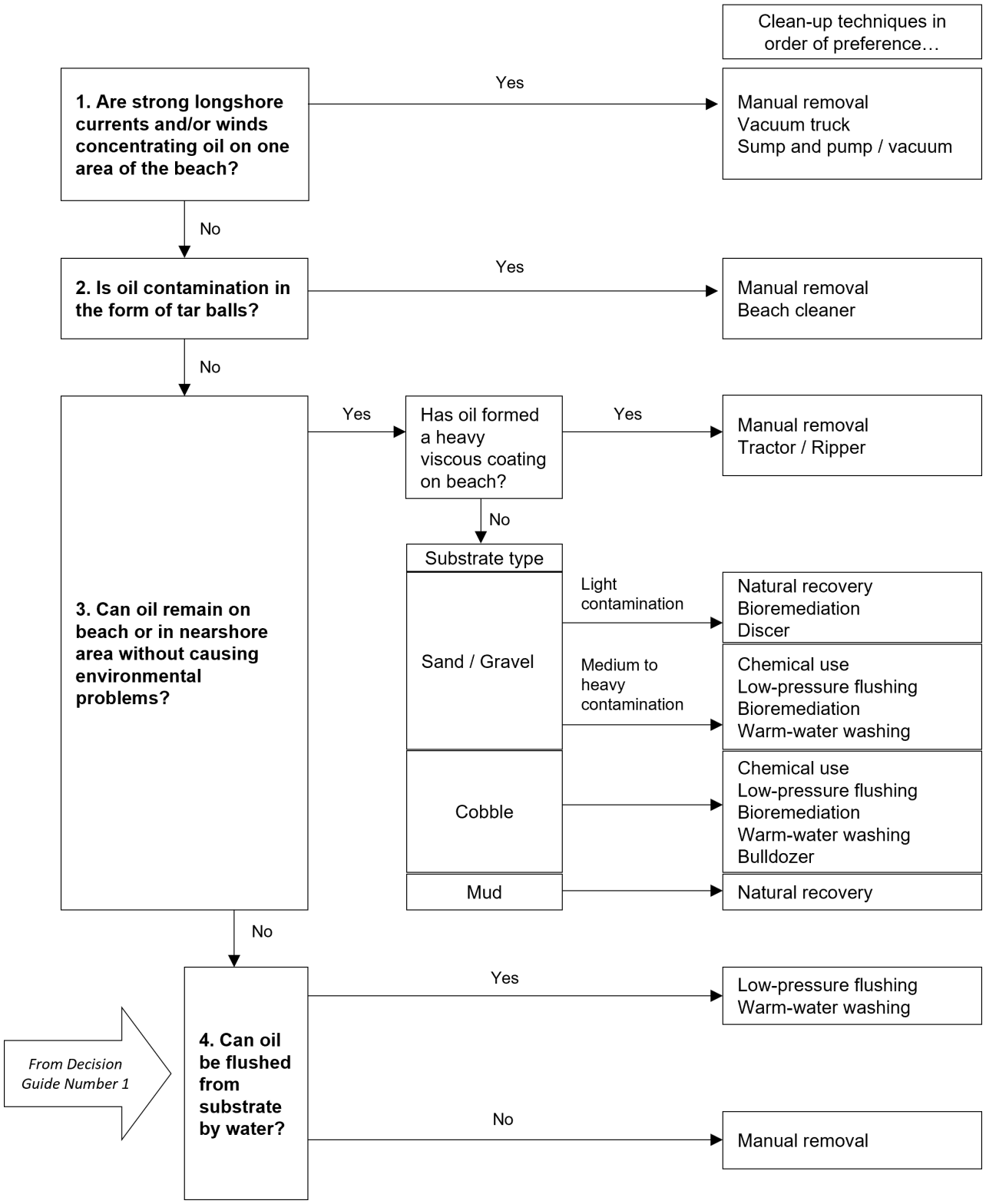


Figure K-3: Shoreline Clean-Up Decision Guide 2

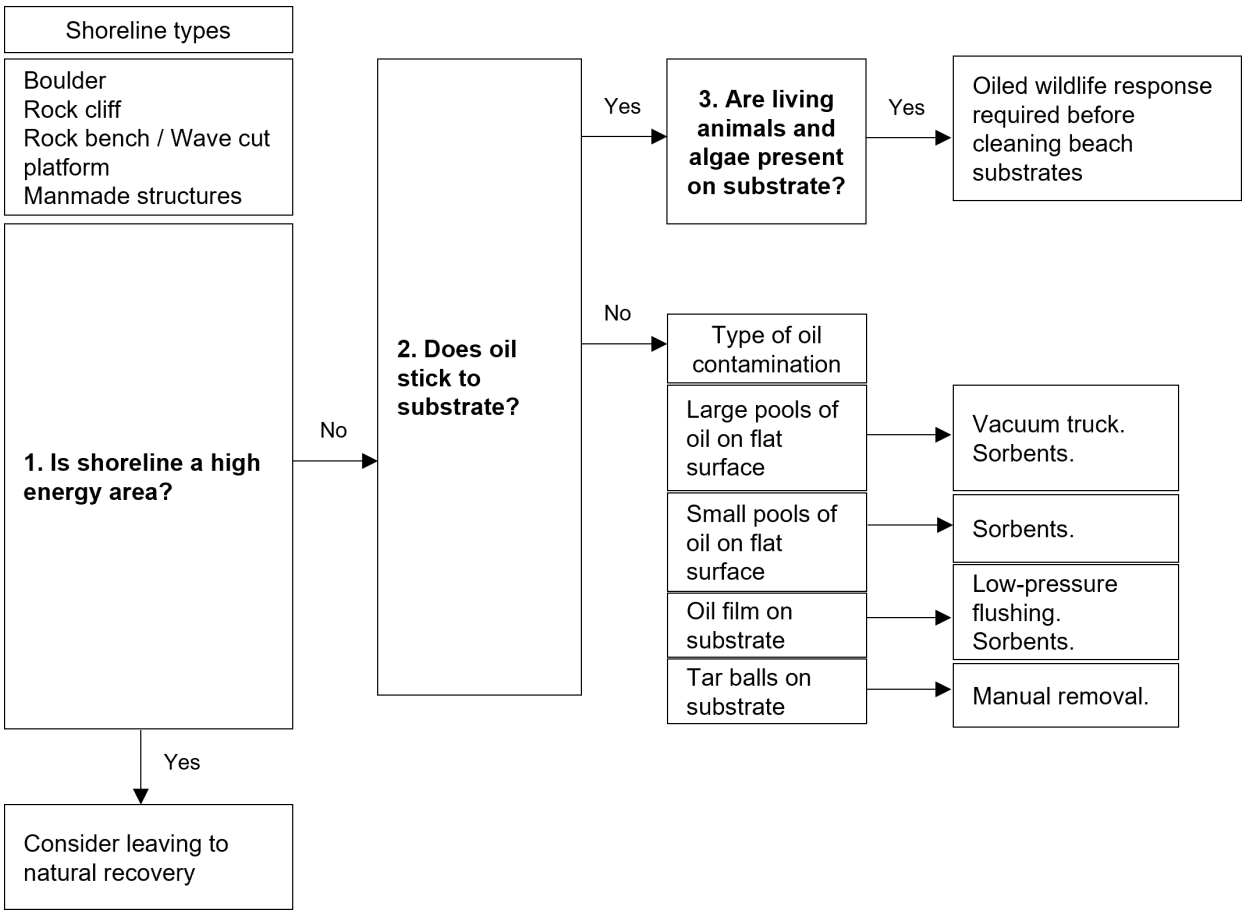


Figure K-4: Shoreline Clean-Up decision Guide 3

Appendix L Operational guidelines for shoreline response

L-1 Worksite preparation guidelines

The following provides guidelines for the preparation of staging areas supporting shoreline clean-up operations.

Organisation and worksite set-up

The worksite does not only include the polluted areas that require cleaning. Several other specific areas must be identified and cordoned off and routes for pedestrians and vehicles should be signposted.

These specific areas are:

- The polluted area;
- The waste storage area, with different types of containers suitable for the different kinds of waste;
- The decontamination area: whatever the size of the spill, a decontamination phase for operational personnel, equipment and tools must be carried out in order to provide some comfort to personnel after each work session, avoiding oiling clean areas, and group together personal clean-up equipment and protective gear, to facilitate the management of the site (cleaning, storage, re-use);
- A rest area, with at least changing rooms, toilets, a first aid kit and cold and hot beverages. Cold or even hot meals can also be organised on the spot provided that a canteen tent or temporary building is available; and
- A storage area for tools and machinery (or equipment warehouse).

Access to the worksite should be restricted and traffic of vehicles should be strictly regulated to avoid accidents.

Preparation

- Prevent the general public from accessing the worksite;
- Delineate accesses for vehicles and machinery (check load-bearing capacity) and routes;
- Channel vehicle and pedestrian traffic;
- Protect the ground (geotextile, roll out mat system…) during operations in sensitive areas (dunes...);
- Prepare and signpost the different areas of activity (on the beach), living areas (locker room, meals, showers, toilets...) and stockpiling areas presenting a risk (fuel, equipment, waste pit....);
- Define a site for fluid storage away from the locker room:
  - Provide an extinguisher for each cabin
  - Set up a recovery system for fuel leaks
- Provide at least minimum lighting for installations and the surrounding area during the winter.

Basic Equipment	Extra Equipment
• Plastic liners, geotextiles • Barrier tape and stakes • Signposting equipment	• Bins, barrels, skips, tanks • Hot and cold beverages Welfare) • Cooking oil, soap (Welfare) • Earthmoving equipment

Primary Storage of Waste

A primary storage site is:

- An emergency staging area of the immediate deposit of the waste collected before its transfer to either an intermediate long term storage site or if possible directly to a treatment facility; and
- A key stage in the waste management process for sorting, labelling and quantifying the types and volumes of waste collected and when possible, reducing volumes to be transported by pre-treatment.

The storage site must be closed as soon as clean-up operations are completed.

The return of the site to its original condition implies:

- A contamination diagnosis made by an organisation specialised in ground pollution, decontamination operations if needed and the approval of the authorities; and
- In some cases, botanical evaluations to define a plant cover restoration operation.

- Segregate the different types of waste
- Protect containers from rain water and to contain odours
- Protect containers from prolonged exposure to sunlight if necessary
- Ensure security to prevent unauthorised dumping

Primary waste storage sites should meet certain criteria:

- Close proximity to the site of clean-up;
- Good access to roads for heavy lorries; and
- A flat area with enough space away from environmentally-sensitive areas (vegetation, groundwater) and out of reach of the sea tides and waves.

- Depending on the volume of waste, site characteristics and availability of containers, prepare:
  - Staging areas
  - Pits if necessary
  - Platform within earth berms
  - Platform for bagged solids and liquids in tank.
- Protect areas using watertight plastic liners
- Lay fine gravel or sand at the base of the storage area to protect the membranes
- Prepare rain water or effluent management
- Ensure correct labelling of the containers to avoid mixing the different types of waste (liquid, solid, non-biodegradable – oiled plastics, contaminated cleanup equipment, biodegradable – oiled seaweed, faunal)
- Control access to the cleanup sites and protect access routes using lining and/or geotextiles

Base Camp / Rest Area

The rest area (base camp) should at least consist of:

- Changing rooms;
- Toilets; and
- A rest area.

At base camp, operators must be provided with:

- A first aid kit; and
- Hot and cold beverages, meals.

Selection of the rest area must meet certain criteria:

- Close proximity to the clean-up site;
- Easy access; and
- A flat area with enough space away from environmentally sensitive areas.

Equipment

- Shelter/rest area (tent, temporary building;
- Portable toilets (at least one for men and one for women);
- Locker rooms;
- First aid kit;
- Fire extinguisher; and
- Communication equipment.

Storage Area for Equipment and Machinery

This area consists of and equipped repair and maintenance site.

In order to avoid incidents and clean-up equipment failures, equipment should only be used by trained personnel and all equipment should regularly be checked for conformity with standard operating procedures and safety.

- Check and adjust daily levels of gasoline, diesel, oil, water and other fluids
- Regularly maintain the machines (pumps, pressure washers...)
- Equipment must be checked, counted by the person in charge of logistics and stored daily at the end of the work day
- Some pieces of equipment must be washed or at least rinsed daily, with proper recovery of cleaning effluent, other kinds of equipment should be washed weekly or at the end of operations
- Set up a systematic maintenance-cleaning-repair operation at the end of each week
- Small tools and equipment and even detachable parts of all equipment remaining outside should be securely stored away (eg stainless steel bucket of small sand screeners)
- In case of interruption of operations, large pieces of equipment should be moved to a supervised site
- Regularly check equipment for conformity and safety

The storage area for equipment and machinery must meet certain criteria:

- Close proximity to the site of clean-up;
- Easy access; and
- A flat area with enough space away from environmentally-sensitive areas.

Equipment

- Cabins;
- Hut;
- Maintenance equipment and tools; and
- Cleaning equipment.

L-2 Manual clean-up guidelines

Oil, polluted sediment and debris are removed by hand or with the help of manual tools and then stored for disposal.

Conditions of use

- Pollution : all types ; most often scattered pollution; on large spills, if implementation of other techniques is impossible;
- Pollutant : all types;
- Substrate : all types; sufficient load bearing capacity for pedestrians and light equipment; and
- Site: all types sufficiently accessible and which tolerate intensive traffic.

Equipment

Basic Equipment:

- Scrapers (paint scrapers, long handle scrapers...), rakes, brushes, forks; and
- Landing nets, shovels, trowels.

Extra Equipment:

- Waste containers, big bags, bins, plastic bags; and
- Front-end loader (for disposal).

PPE: At least protective clothing: overalls, boots, gloves, etc. depending on the nature of the pollutant, expose and responder activity.

- Divide the response personnel among three functions:
  - Collection/scraping/gathering
  - Placing in bags/waste containers
  - Disposal
- Rotate the teams among the three functions;
- The waste can be disposed of manually or with the use of mechanical means if possible;
- Don’t overfill bins, plastic bags; and
- Don’t remove excessive quantities of sediments.

Impact

- Impact insignificant to heavy, depending on the type of substrate. Risk of destroying the structure of the substrate in marshes. Erosion;
- Potentially destructive effects on vegetation (dunes, marshland);
- Deconstruction and destabilisation of the foot of the dune (upper end of beach); erosion, destruction of the dune and the associated vegetation, decrease in biodiversity and fertility by reduction of the low water mark; and
- Can tend to fragment the oil in certain conditions.

Performance

This is a highly selective technique, but requires a lot of time and personnel. If not done correctly, there is a risk of removal of large quantities of clean sediment.

L-3 Mechanical clean-up guidelines

This technique consists of collecting the oil in order to facilitate its removal from the beach. Collection is carried out using a tractor, ATV or earthmoving vehicle or earthmoving equipment.

Conditions of use

- Pollution : heavy pollution, continuous slick;
- Pollutant : slightly to very viscous oil;
- Substrate : vast, flat foreshore with wet fine-grain sand (very damp to saturated) and a good load-bearing capacity, without ripple marks; and
- Site: accessible and sufficient load bearing capacity for earthmoving equipment, sufficiently large to allow vehicles to manoeuvre.

Equipment

Basic equipment:

- Backhoe loader;
- Grader/bulldozer;
- Tractor or loader with front blade; and
- Front-end loader or lorry (for removal).
- PPE: At least suitable for heavy machinery operation

Impact

- Normally only removes the oil, but some sediment may also be taken with it (if the operator is poorly supervised or inexperienced), especially if used on light pollution or an unsuitable site;
- High risk of disturbance due to traffic and mixing of oil with sediment; and
- May lead to reduction of beach stability and beach erosion/loss of beach area.

Minimum workforce required: 2 people per vehicle (1 drive + 1 assistant).

Waste: oil mixed with a varying quantity of sediment; but can rapidly become unselective if scraping is carried out on moderate pollution (should be avoided).

- Consists of bringing the oil together in order to facilitate its removal from the beach. Scraping is carried out using a tractor or earthmoving equipment fitted with a front end blade in an oblique position. According to the viscosity of the oil, two options are available:
  - (case 1) fluid oil: radial or converging scraping towards a collection point on the foreshore; removal by pumping
  - (case 2) more viscous oil /solids: concentration to form windrows, by successive slightly curing passes parallel to the water line; subsequent removal of windrows
- Should only be carried out on heavy pollution; do not use on moderate to light pollution
- Inform and supervise operators; use experienced operators
- Work methodically
- Set up traffic lanes on the beach in order to reduce oil and sediment mixing
- Don’t remove excessive amounts of non-contaminated materials
- Don’t fill the bucket of loader more than 2/3 capacity
- Don’t drive on polluted materials

L-4 Shoreline vessel access guidelines

There are numerous landing craft vessels available in the North West Shelf area. These vessels are capable of grounding out; therefore the vessels can access a contacted area on high tide, ground out, unload equipment and personnel, reload with waste oil then depart on the next high tide. The Santos Offshore - Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) describes the specifications for beach landing craft, and describes Santos vessel monitoring processes.

Mechanical equipment and PPE are to be mobilised to the nominated marine operational base for onward movement to the affected locations.

For shoreline clean-up of remote islands, the following guidelines will be considered so as to minimise the secondary impacts of high numbers of spill response personnel on shorelines:

Vessels are to be mobilised to the designated deployment Port to mobilise shoreline clean-up teams by water. The shoreline clean-up will be undertaken through on-water deployment to the defined shorelines in 4 stages:

1) Drop off of 6-person clean-up containers to shoreline contact locations defined by IMT through observation data;
2) Deployment of marine and environmental specialists to demarcate the clean-up zones with barrier posts and tape to prevent secondary contamination impacts to flora and fauna by the clean-up teams;
3) Deployment of small clean-up teams with a trained/competent shoreline responder as a Team Leader to conduct clean-up methods (flushing, bag and retrieve, etc.) with all waste being bagged and stored in temporary bunding made of HDPE above the high-tide mark; and
4) Deployment of waste pickup barges to retrieve collected wastes from the temporary bunding and to complete the shoreline clean-up and final polishing.

Appendix M Resourcing requirements for OMP: shoreline clean-up assessment

Shoreline clean-up assessment teams will comprise two to three members per team and are assumed to be able to cover 10 km per team per day. Teams may be able to exceed this distance, especially if remote sensing techniques (e.g. UAVs) are employed to cover shorelines that have access limitations, which includes many receptor locations in the EMBA.

Santos has used both stochastic and deterministic modelling data for shoreline contact to plan for the worst-case shoreline and habitat assessment personnel requirements. Initially, shoreline clean-up assessment may be conducted via reconnaissance surveys and later confirmed via ground and/or vessel surveys.

Spill modelling indicates shoreline accumulation of up to a maximum of ~209 m^3 of MDO at Ningaloo Coast North (19.8 km of shoreline accumulation). Hydrocarbons could also accumulate onto shorelines of the Muiron Islands (maximum ~23 m^3, 11.3 km of shoreline accumulation) (Table M 1).

No shoreline accumulation at or above the moderate threshold of >100 g/m^2 was predicted for the LOWC scenario. Shoreline clean-up has been selected as a secondary strategy for the LOWC scenario in case there are areas contacted in the event of a spill.

Based on the worst case length of oiled shoreline at Ningaloo Coast North of 19.8 km, two (2) Shoreline Clean-up Assessment Teams (SCAT) is considered the most viable approach to the shoreline clean-up effort due to various operational and environmental considerations (Section 15.4.1). Oil does not start accumulating (at the moderate threshold) until day 2.

The worst-case personnel requirements for SCAT for this activity are for 4–6 personnel; 2 teams with 2–3 personnel each (1 Team Leader and 1–2 Team Members). Table M 2 provides the resource capability available to Santos that may be used to implement SCAT.

Table M 1: Resource requirements for shoreline clean-up assessment for all locations contacted ≥100 g/m^2 based on stochastic results for the surface MDO release scenario

Location	Min. arrival time shoreline oil accumulation ≥100 g/m^2 (days)	Max. length of shoreline oiled (km) ≥100 g/m^2	Estimated No. of teams required
Ningaloo Coast North	2 days, 4 hours	19.8	1-2
Muiron Islands	2 days, 7 hours	11.3	1-2
Total estimated SCAT teams required			**2**

Note: SCAT numbers not to be added up from this table as spill will not contact all receptors modelled (as these are stochastic results). Number of personnel required will be based on direction of spill and timeframes to contact.

Source: GHD (2020)

Table M 2: Shoreline clean-up assessment – resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Shoreline assessment team leaders	Santos	12	Perth, Varanus Island	24-72 hours from time of shoreline contact prediction (WA-based, Santos personnel, AMOSC staff and Core Group personnel)
	AMOSC Core Group	As per monthly availability	Perth, Dampier and other Australian locations	
	AMOSC staff	12 trained in SCAT	Perth and Geelong	
	OSRL	18	Perth and international	5 personnel available from 2–3 days, remaining personnel available from

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
				4–5 days (subject to approvals/ clearances)
Shoreline assessment team members	Santos contracted work force hire company (e.g. Dare)	As per availability (up to 2,000)	Australia wide	Subject to availability (indicatively 72+ hours)
Drones and pilots ** To assist shoreline and vessel-based surveillance	AMOSC	1 X Phantom 4 Drone 1 x pilot	Fremantle	Response via duty officer within 15 minutes of first call – AMOSC personnel available within 1 hour of initial activation call. Equipment logistics varies according to stockpile location (refer to Table 10-12)
	OSRL – Third Party UAV provider	2 x qualified remote pilots, however response is on best endeavours basis	Perth	Depending on the port of departure, 1–2 days if within Australia
	Local WA hire companies	10+	Perth and regional WA	<48 hours

Appendix N Operational and Scientific monitoring capability

Ningaloo Vision CoPFAR activities

The North West Shelf Bridging Implementation Plan (NWS-BIP) (7715-650-ERP-0002) defines the 3-step process for ensuring that Operational and Scientific Monitoring capabilities of each activity are adequately covered by the existing information described within the NWS-BIP (Section 1.1 and Appendix A of the NWS-BIP).

Step 1: Determine if the new activity EMBA fits within the North West Shelf OSM-BIP Combined EMBA

Comparison of the EMBA for the NV CoPFAR activities (Figure 3-1 in the Ningaloo Vision CoPFAR EP [7715-650-EIS-0007]), shows that this fits within the North West Shelf OSM-BIP Combined EMBA (Figure 2-1 in the NWS OSM-BIP).

Step 2: Determine the locations requiring a baseline review and whether these locations are currently included in the NWS-BIP

Understanding the presence or absence, suitability and quality of baseline data for locations and associated receptors predicted to be contacted within 7 days is an important preparatory measure for OSM first strike. During a spill event, the first strike monitoring capability will be prioritised to those receptors with insufficient baseline data (deemed first-strike monitoring priorities) to collect baseline data post-spill pre-impact.

As per Section 2.2 of the NWS OSM-BIP, receptors requiring a baseline data review were identified as those sensitive receptors contacted by hydrocarbons at the low threshold for floating (≥1 g/m^2), shoreline contact (≥10 g/m^2), entrained (≥10 ppb), and dissolved (≥10 ppb) within 7.0 days at a probability >5%.

The locations requiring a baseline data review for this activity are presented in Table N-1 and Table N-2 and are included within Table 2-2 of the NWS OSM-BIP. Table 4-3 of the NWS OSM-BIP lists the proposed priority monitoring locations based on an assessment of whether there is enough suitable baseline data for these locations.

Step 3: Determine whether the capability requirements and monitoring arrangements of the new activity exceed or are met by the capability requirements outlined in Section 8 and capability arrangements described in Sections 9 and 10 of the NWS OSM-BIP

As per the criteria outlined in Appendix A of the NWS OSM-BIP, less than 3 emergent receptors are contacted within 7 days at a probability of >5% (refer to Table N 1). Therefore, the OSM capability requirements for NV CoPFAR activities are met by the worst-case capability requirements presented in Sections 9 and 10 of the NWS OSM-BIP. Therefore, additional deterministic modelling for NV CoPFAR activities is not required to inform OSM first-strike capabilities.

For the subsea crude LOWC scenario, no receptor contact is predicted within seven days at a probability >5%. Additionally, no dissolved hydrocarbon exposure was predicted to occur ≥10 ppb for any spill simulation, and consequently, no results are reported. For entrained hydrocarbons ≥10 ppb, Ningaloo Offshore and Ningaloo Outer NW are contacted at a probability >5% within 17 and 18 hours respectively (Table N-2).

The results of the annual baseline assessment are provided within the Environment Functional Team Folder on the Santos ER SharePoint so that this information is accessible to guide Santos IMT Environmental roles and monitoring provider roles in the event of activating oil spill scientific monitoring.

Table N-1: Scientific monitoring priority areas for the Ningaloo Vision CoPFAR activities based on stochastic modelling results for the MDO vessel spill

Floating oil contact locations	Contact probability (%) floating oil ≥1 g/m²	Minimum arrival time ≥1 g/m² (hours)
Ningaloo Outer NW	28.7	4
Ningaloo Offshore	100	2
Shoreline contact locations	**Contact probability (%) shoreline oil >10 g/m²**	**Minimum arrival time >10 g/m² (hours)**
Ningaloo Coast North	15.3	52
Entrained hydrocarbon contact locations	**Contact probability (%) entrained hydrocarbons ≥10 ppb**	**Minimum arrival time ≥10 ppb (hours)**
Ningaloo Outer NW	67.3	4
Ningaloo Offshore	100	2
Ningaloo Coast North	5.3	26
Ningaloo Outer Coast North	10	14
Dissolved hydrocarbon contact locations	**Contact probability (%) dissolved hydrocarbons ≥10 ppb**	**Minimum arrival time ≥10 ppb (hours)**
Ningaloo Outer NW	51.3	4
Ningaloo Offshore	100	2
Ningaloo Outer Coast North	5.3	14

Source: GHD (2020)

= *submerged receptor*

Table N-2: Scientific monitoring priority areas for the Ningaloo Vision CoPFAR activities based on stochastic modelling results for the LOWC scenario

Entrained hydrocarbon contact locations	Contact probability (%) entrained hydrocarbons ≥10 ppb	Minimum arrival time ≥10 ppb (hours)
Ningaloo Offshore	100.0	17
Ningaloo Outer NW	83.67	18

Source: RPS (2024)

= *submerged receptor*

Appendix O Forward operations guidance

The IMT operate from Perth within the Santos IMT room. These rooms are equipped and subject to reviews and updates as detailed in the Santos Incident Management Plan – Upstream Offshore (SO-00-ZF-00025).

For a significant Level 2/3 response requiring coordination of resources to be deployed to the field, Santos will establish a forward operations base (FOB). For a Level 2/3 spill crossing from Commonwealth to State waters (cross-jurisdictional spills) DoT will establish an FOB.

To facilitate a streamlined response, FOBs are required close to the response operational areas equipped with near duplicated IMT equipment and personnel. Further information on FOBs is provided in the Santos Oil Spill Response – Forward Operating Base Guideline (SO-91-IF-20017).

For a Ningaloo Vision CoPFAR activities spill response, Santos may establish an FOB at the Exmouth Volunteer Marine Rescue building on Madaffari Drive, Exmouth, and the forward staging area at Exmouth Freight and Logistics (EF&L), who currently provide transport and logistical services for Santos. In addition, Santos has first strike response equipment (dispersant spray units, dispersant test kits, oil spill boom) already located at EF&L and trained personnel to support the operation of the equipment. There are also three other potential FOB locations within the Exmouth region:

- SES Emergency Centre;
- Building 142 of the Harold E Holt Naval Base; and
- The Ningaloo Centre.

Additional FOBs may be set up as operational requirements dictate. Based on shoreline areas that might be impacted, potential additional FOB locations include Dampier (Toll Dampier Supply Base, Yard 4).

Refer to Santos Oil Spill Response – Forward Operating Base Guideline (SO-91-IF-20017) for details on the potential FOB locations.

Appendix P Oiled wildlife response personnel and equipment

In the event of a spill impacting wildlife, Santos will commence arrangements to mobilise personnel and equipment to fill responder positions as identified in the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) and WAOWRP.

This appendix outlines the current OWR equipment, personnel and services available to Santos through current arrangements.

Overall OWR capability per OWR strategy

The overall OWR capability of Santos is outlined in Table P 1. Santos has access to aircraft that could be used for wildlife reconnaissance within hours of a spill. This would be followed by further access to vessels and Santos personnel trained in OWR that could be mobilised within 24 hours for vessel and wildlife shoreline reconnaissance, demonstrating Santos' ability to mount a swift response that could also be sustained as long as required.

Santos has the capability to set up oiled wildlife field stations within 3–4 days of a spill through access to AMOSC equipment and equipment purchased at the time of a spill. Santos could also arrange the transport of wildlife from the field to a primary care facility.

The indicative personnel required for a high impact-rated response is 93 personnel (as per the WAOWRP) (DBCA, 2022a), however depending on the number and species impacted, may require many more. Santos' current arrangements could support a large scale OWR (requiring >93 personnel) mainly through support staff, such as, non-technical wildlife support roles (management, logistics, planning, human resourcing, transporter, cleaners, trades persons, security etc). These roles could be filled by Santos personnel and labour hire agencies that can provide workers that undergo an induction and basic training. In addition, many of the roles required for an OWR require technical expertise and Santos will need to activate OWR arrangements with AMOSC and OSRL to fulfil roles, as well as make contractor arrangements for accessing skilled wildlife personnel at the time of a spill.

Table P 1: Santos OWR capability per OWR strategy

OWR Strategy	Considerations	Equipment/Personnel	Location	Mobilisation Timeframe
Reconnaissance	Identify opportunities to create synergies with surveys required for Monitor and Evaluate and Scientific Monitoring activities	Rotary Wing Aircraft & flight Crew	Karratha	Wheels up within 1 hour for Emergency Response.
		Drones and pilots	Local WA hire companies	1-2 days
		Contracted vessels and vessels of opportunity Santos Contracted Vessel Providers Vessels of opportunity identified through AIS Vessel Tracking.	Vessels mobilised from Darwin. Locations verified through AIS Vessel Tracking Software.	Pending availability and location. Expected within 12 hours.
		Aerial surveillance crew Santos staff AMOSC staff AMOSC Core Group personnel available Additional trained industry mutual aid personnel available	Perth and Varanus Island (VI) (Santos aerial observers) Australia wide	Santos trained personnel – next day mobilisation to airbase <24 hours
Preventative actions	Mainly effective for bird species Requires relevant WA/NT licence approval	5 x AMOSC Wildlife fauna hazing and exclusion kits 1 x AMOSC Breco buoy	4 x Fremantle, 1 x Geelong 1 x Fremantle	Location dependent
Rescue and field processing	Wildlife handling and first aid should only be done by persons with appropriate skills and experience or under the direction of DBCA	4 x AMOSC Oiled Fauna Kits (basic medical supplies, cleaning/rehab, PPE)	1 x Exmouth, 1 x Broome, 2 x Geelong	Location dependent
		2 x DBCA OWR trailers	1 x Kensington NSW 1 x Karratha WA	Location dependent
		50% of OSRL OWR response packages (Wildlife Search and Rescue kits / Cleaning and Rehab. kits (including field first aid)	5 x Singapore, 2 x Bahrain, 7 x UK, 5 x Fort Lauderdale	Location dependent
Transport	Transport of oiled animals by aeroplane or helicopter may be restricted due to Civil Aviation Safety Authority (CASA) regulations; such transport will depend on the level of oiling remaining on animals. Therefore, consultation with the air transport provider must take	Contracted vessels and vessels of opportunity Santos Contracted Vessel Providers Vessels of opportunity identified through AIS Vessel Tracking.	Vessels mobilised from Darwin. Locations verified through AIS Vessel Tracking Software.	Pending availability and location. Expected within 12 hours.

OWR Strategy	Considerations	Equipment/Personnel	Location	Mobilisation Timeframe
	place before transport to ensure the safest and most efficient means			
Primary care facility	OWR container could be placed on the deck of a suitably sized vessel for field processing in remote locations (benefits associated with temperature regulation and access to water and electricity) An OWR container on a vessel could also be used to aide transport form offshore islands	OWR container/mobile washing facility 2 x AMOSC 4 x AMSA 2 x DoT	AMOSC – 1 x Fremantle, 1 x Geelong AMSA - 1 x Dampier, 1 x Darwin, 1 x Devonport, 1 x Townsville DoT – 1 x Fremantle (AMOSC warehouse), 1 x Sydney	Location dependent
		AMOSC call off contract with DWYERTech NZ – a facilities management group	New Zealand	Availability within 24 hrs of call-off
Personnel	Untrained personnel would receive an induction, on-the-job training and work under the supervision of an experienced supervisor	Santos provides OWR training to staff, and to-date, approximately 20 personnel have received OWR training.	Perth and Varanus Island	<48 hours
		Santos maintains labour hire arrangements for access to untrained personnel		
		1 x AMOSC Oiled Wildlife Advisor	Perth, Western Australia	<48 hours
		62 x trained industry personnel (AMOSC OWR Strike Team members)	-	<48 hours
		AMOSC MOU with Phillip Island National Park (PINP) (best-endeavours availability)	Victoria, Australia	Best-endeavour availability
		AMOSC MOU's – WA organisations	WA	Best-endeavour availability
	Sea Alarm staff act in a technical advisory role and do not engage in hands-on OWR activities but work impartially with all parties (titleholder, local authorities, mobilised experts and local experts, and response groups), aiming to maximise the effectiveness of the wildlife response.	Via OSRL Access to 24/7 technical advice (remote or on-site) from the Sea Alarm Foundation Access to OWR assessment service from the Global Oiled Wildlife Response Service (GOWRS) consisting of a ready-to-deploy team of 4 specialists in Operations/Planning, Field & Capture, Rehab & Facilities, Vet/Incident-specifics.	Belgium Various locations in northern and southern hemisphere	Sea Alarm: Upon notification able to provide remote advice and option to mobilise a Sea Alarm Technical Advisor on-site during an incident GOWRS: Mobilised on a best endeavours basis

Australian Maritime Safety Authority (AMSA)

AMSA maintains four oiled wildlife response containers/ mobile washing facilities in Dampier, Darwin, Devonport and Townsville. All resources under the National Plan (including the four OWR containers) are available to Santos through formal request to AMSA under the arrangements of the National Plan. The containers also include some limited PPE and fresh and wastewater pools.

Western Australia Department of Transport (DoT)

The WA DoT maintains 2 x OWR containers/ mobile washing facilities (WA Fremantle – AMOSC warehouse, and NSW Sydney) which are available through the SHP-MEE and the AMSA National Plan on request.

Australian Marine Oil Spill Centre (AMOSC)

Santos is a participating Member of AMOSC and as such has access to AMOSC's Level 2/3 oiled wildlife equipment and personnel as outlined in the AMOSPlan.

Equipment

Table P 2 provides a summary of the oiled wildlife response equipment maintained by AMOSC.

Table P 2: AMOSC wildlife equipment

Location	Oiled fauna kits (basic medical supplies, cleaning/rehab, PPE)	Fauna hazing and exclusion equipment	Oiled wildlife washdown container (mobile washing facility)
Fremantle	-	4 x fauna hazing & exclusion kit 1 x Breco bird hazing buoy	1 x Oiled Wildlife Washdown Container
Exmouth	1 x Oiled fauna kit	-	-
Broome	1 x Oiled fauna kit	-	-
Geelong	2 x Oiled fauna kit	1 x fauna hazing & exclusion kit	1 x Oiled Wildlife Washdown Container
Total	**4 x Oiled fauna kit**	**5 x fauna hazing & exclusion kits** **1 x Breco bird hazing buoy**	**2 x Oiled Wildlife Washdown Containers**

Personnel

AMOSC currently has the following arrangements in place for OWR personnel:

- 1 x AMOSC OWR Officer available to act as an Industry Oiled Wildlife Advisor (OWA)
- 62 x trained industry personnel (AMOSC OWR Strike Team members)
  - Volunteer OWR trained industry personnel
- Wildlife Care Groups:
  - 35 introductory trained personnel
  - 24 completed management course
  - 16 completed Responder course
- AMOSC call off contract with DWYERtech Response NZ
  - A facilities management group with availability within 24 hours of call off – 2 x personnel

AMOSC has the following MoU's in place:

- Phillip Island National Park (PINP), (VIC) (best-endeavours availability)
  - Approx. 50 PINP staff – collection/facility ops/rehabilitation

  - Approx. 45 volunteers – collection/facility ops/rehabilitation
  - Approx. 20 staff – animal feeding
  - 6 x PINP staff – wildlife emergency response including cetacean stranding/entanglement
  - 17 x PINP staff – wildlife team leaders
  - 5 x PINP staff – IMT Training
- Blue Planet Marine (WA)
  - 10-20 Personnel (best endeavours to respond)
- WA Seabird Rescue
  - No permanent staff, ~30 volunteers
- WA Native Animal Rescue
  - 5 staff, ~80 volunteers
  - Wangara – Avifauna and mammals
  - Broome – Marine turtles
- WA Wildlife
  - 10 staff, ~80 volunteers
- Darling Range Wildlife (WA)
  - 5 staff, ~50 volunteers
- Mandurah Wildlife (WA)
  - 5 staff, ~30 volunteers

Oil Spill Response Limited (OSRL)

Through the associate membership, Santos has access to the following OWR equipment and personnel services from OSRL.

Equipment

OSRL maintains a Level 3 wildlife equipment stockpile. This equipment is stored across the OSRL base locations and is designed to support the first 48 hours of the response and to ensure availability of critical equipment items that may be difficult to source locally (Note: this equipment does not provide everything that will be required to successfully operate a primary care facility and is focussed primarily on bird casualties (n=100)). Equipment is sorted according to search and rescue (including field first aid), medical, and cleaning and rehabilitation (Table P 3).

Table P 3: OSRL wildlife equipment (as per OSRL Equipment Stockpile Status Report, April 2024)

OWR Response Package	UK	Singapore	Bahrain	Fort Lauderdale
Wildlife Search and Rescue BHR	-	-	-	-
Wildlife Cleaning and Rehabilitation Part 1	2	1	1	1
Wildlife Cleaning and Rehabilitation Part 2	2	1	-	1
Wildlife Cleaning and Rehab. Medical	1	1	-	1
Wildlife Search and Rescue	1	1	1	1
Wildlife Search and Rescue Medical	1	1	-	1

Personnel

Through the OSRL SLA, Santos has access to 24/7 technical advice (remote or on-site) from the Sea Alarm Foundation, a small non-governmental organisation based in Brussels, Belgium that works to improve global preparedness and response for oiled wildlife incidents. Two technical Advisors are available, with one providing remote support and the other available to be mobilised for on-site support, either in-field or at the Command Post

(typically working with the Wildlife Branch Director or the Planning and Operations sections as appropriate). Sea Alarm staff will act in a technical advisory role at the incident management level and will work impartially with all parties (titleholder, local authorities, mobilised experts and local experts, and response groups), with the aim of maximising the effectiveness of the wildlife response.

Through OSRL's ongoing funding of the GOWRS Project, a wildlife assessment team of 4 wildlife experts can be mobilised in-field for up to 4 days in addition to the Sea Alarm resources noted above. The GOWRS Oiled Wildlife Assessment Service is a ready-to-deploy 4-person team delivered by a network of 10 leading wildlife response organisations. The four-person team will initially deploy for 4 days to provide an on-the-ground technical assessment of wildlife response needs and the professional capabilities of local responders. The team will inform the client of the feasibility of a full-scale professional response and the details of the GOWRS expertise that is available to deliver to the scale of such a response. There is also access to additional oiled wildlife resources on a 'reasonable endeavours' only basis through the GOWRS partners.

In addition, through the SLA, Santos has the option to access OSRL's internal staff with OWR expertise (1 x UK) as part of the 18 personnel commitment for any single incident.