9885-650-PLN-0002

Santos

Mutineer, Exeter, Fletcher, Finucane Cessation of Production Oil Pollution Emergency Plan

PROJECT / FACILITY	Mutineer, Exeter, Fletcher, Finucane Project
REVIEW INTERVAL	60 Months
SAFETY CRITICAL DOCUMENT	NO

Rev	Owner	Reviewer/s Managerial/Technical/Site	Approver	Functional Endorser
3	Senior Oil Spill Response Coordinator	Environmental Approvals Team Lead	Manager – HSE Offshore WA	Crisis, Emergency Response and Security

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REV No	DATE	REVISION
A	18/01/2018	Internal and AMOSC review
B	07/03/2018	Final Santos review
0	12/03/2018	Submission to NOPSEMA
1	31/05/2018	Updated with supplementary information provided in Santos response to NOPSEMA's RFWI and consultation feedback from DoT
1.1	07/08/2018	Revised to incorporate updated ALARP assessment for capping stack
2	24/05/2021	Updated to align with MoC-236 and MoC-225. Document structure updated. IMT arrangements updated. Response levels updated remove the reference to volumes. Response personnel updated.
2A	14/10/2021	Updated to include new document number as per Santos' new document management system, and to account for Floating Asset Removal activities outlined in the EP
2B	16/11/2021	Final Santos review
3	17/12/2021	Submission to NOPSEMA

Distribution	Oil Pollution Emergency Plan	
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IMT Room – Perth office		● x 4
AMOSC	●	
DoT	●	
AMSA	●	
OSRL	●	

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List of acronyms

Abbreviation	Description
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
APASA	Asia-Pacific Applied Sciences Associates
API	American Petroleum Institute
APPEA	Australian Petroleum Production & Exploration Association
BAOAC	Bonn Agreement Oil Appearance Codes
BRUV	Baited Remote Underwater Video
CMT	Crisis Management Team
CSR	company site representative
DBCA	Department of Biodiversity, Conservation and Attractions
DISER	Department of Industry, Science, Energy and Resources
DMIRS	Department of Mines, Industry Regulation and Safety
DoT	Department of Transport
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environment Regulation
EMBA	environment that may be affected
EP	Environment Plan
ER	emergency response
FOB	forward operating base
GIS	geographic information system
GPS	global positioning system
HMA	Hazard Management Agency
HR	human resources
IAP	Incident Action Plan
ICC	incident command centre
IMT	Incident Management Team
IR	industrial relations
IRT	Incident Response Team

Abbreviation	Description
LOWC	loss of well control
MARPOL	International Convention for the Prevention of Pollution from Ships
MEECC	Maritime Environmental Emergency Coordination Centre
MEER	Maritime Environmental Emergency Response
MNES	matters of national environmental significance
MODU	mobile offshore drilling unit
MoU	Memorandum of Understanding
MSA	Master Services Agreement
MSP	monitoring service providers
NEBA	net environmental benefit analysis
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
OPEP	Oil Pollution Emergency Plan
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSC	On-Scene Commander
OSRL	Oil Spill Response Limited
OSTM	oil spill trajectory modelling
OWR	oiled wildlife response
SCP	Source Control Plan
SFRT	Subsea First Response Toolkit
SHP-MEE	State Hazard Plan for Maritime Environmental Emergencies
SIMA	spill impact mitigation assessment
SMP	Scientific Monitoring Plans
SMPC	State Marine Pollution Coordinator
SMPEP	Shipboard Marine Pollution Emergency Plan
SOPEP	Shipboard Oil Pollution Emergency Plans
TRP	Tactical Response Plan
VOC	volatile organic compound
VOO	vessels of opportunity
VPO	Vice President Offshore Upstream WA
WA	Western Australia
WAOWRP	Western Australian Oiled Wildlife Response Plan
WOMP	Well Operation Management Plan
WSP	waste service provider

Abbreviation	Description
WWC	wild well control

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1 Quick reference information

<table>
<tr><th>Parameter</th><th colspan="4">Description</th><th>Further information</th></tr>
<tr><td>Petroleum Activity</td><td colspan="4">Mutineer, Exeter, Fletcher, Finucane Cessation of Production, including inspection, maintenance and repair of subsea infrastructure and floating asset removal of submerged/buoyant infrastructure</td><td>Section 2 - Environment Plan (EP)</td></tr>
<tr><td>Location</td><td colspan="4">Commonwealth waters approximately 160 km North of Dampier</td><td>EP</td></tr>
<tr><td>Petroleum title/s (Blocks)</td><td colspan="4">Production Licenses WA-26-L, WA-27-L and WA-54-L</td><td>N/A</td></tr>
<tr><td>Facilities/vessels</td><td colspan="5">One primary vessel and at least one support vessel (maximum of four vessels in operational area at any one time)</td></tr>
<tr><td>Water depth</td><td colspan="4">130–160 metres (m)</td><td>Figure 3-1</td></tr>
<tr><td rowspan="3">Worst-case spill scenarios</td><td>Scenario</td><td colspan="2">Hydrocarbon</td><td>Worst-case volume</td><td rowspan="3">Section 6.1</td></tr>
<tr><td>Loss of Well Control (LOWC) – subsea release</td><td colspan="2">Mutineer-Exeter crude</td><td>1,350 m^3</td></tr>
<tr><td>Surface diesel release (surface spill)</td><td colspan="2">Marine Diesel Oil (MDO)</td><td>604 m^3</td></tr>
<tr><td rowspan="2">Hydrocarbon properties</td><td colspan="4">MDO:
Density at 25 °C = 829 kg/m^3
Dynamic viscosity = 4 cP @ 25 °C
API Gravity = 37.6°
Wax content = 1%
Pour point = −14 °C
Oil property classification = Persistent (medium)</td><td rowspan="2">Appendix A: Hydrocarbon characteristics and behaviour</td></tr>
<tr><td colspan="2">Mutineer-Exeter crude
Specific gravity = 0.8091
Viscosity = 3.027 cP @ 20 °C
API Gravity = 43.4
Wax content = 3%
Pour point = 12 °C</td><td colspan="2">Vale (analogue)
Specific gravity = 0.816
Viscosity = 37 cP @ 20 °C
API Gravity = 42
Wax content = 3.26%
Pour point = −9 °C</td></tr>
<tr><td>Weathering potential</td><td colspan="2">MDO is a mixture of volatile and persistent hydrocarbons with low viscosity. It will spread quickly and thin out to low thickness levels, thereby increasing the rate of evaporation. Up to 60% will generally evaporate over the first two days. Approximately 5% is considered ‘persistent’,</td><td colspan="2">Mutineer-Exeter Light Crude is characterised by a low viscosity and is considered a Group II oil (light) hydrocarbon, as per the grouping classification presented by AMSA (2015). If spilt on the sea surface, the hydrocarbon would rapidly spread and thin out resulting in a large surface area of</td><td>Appendix A: Hydrocarbon characteristics and behaviour</td></tr>
</table>

Parameter	Description		Further information
	which are unlikely to evaporate and will decay over time.	hydrocarbon available for evaporation.	
Protection priorities	Imperieuse Reef Marine Park		

2 First-strike response actions

The initial response actions to major oil spill incidents will be undertaken by the relevant Vessel Master or the Santos Company Site Representative.

Following those initial actions undertaken by the On-Scene Commander or Vessel Master to ensure the safety of personnel on the vessel and to control the source of the spill, the Santos Company Site Representative 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 OPEP is concerned primarily with a large scale (Level 2/3) hydrocarbon spill where the Perth-based Incident Management Team (IMT) and Santos Crisis Management Team (CMT) are engaged for support and implementation of response strategies. Level 1 spills are managed through on-site response and IMT is available to assist with regulatory requirements/notifications and support as 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 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 Incident Commander.

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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	On-Scene Commander/Vessel Master
Immediate	Control the source using site resources, where possible	Control the source using available on-site resources (vessel) Refer to source control plan – **Section 9**	On-Scene 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	On-Scene Commander via Company Site Representative
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	On-Scene Commander via Company Site Representative
60 minutes	Gain situational awareness and begin on-site spill surveillance	If spill reaches marine waters gain further situational awareness by undertaking surveillance of the spill from vessel Refer to Monitor and Evaluate Plan – **Section 9.2**	On-Scene Commander via Company Site Representative Incident Commander
Refer timeframes Go to **Section 7**	Make regulatory notifications within regulatory timeframes	Activate the External Notifications and Reporting Procedures – **Section 7**	Initial notifications by Environment Unit Leader/ Safety Officer –
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

When (indicative)	Activations		Who
	Objective	Action	
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 Go to **Section 8** Review First-strike Activations (this table)	Incident Commander Planning Section Chief
Refer timeframes **Section 7**	Make regulatory notifications as required Notify and mobilise/put on standby external oil spill response organisations and support organisations, as required	Go to **Section 7**	Initial notifications by Environment Unit Leader/ Safety Officer 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)
Refer timeframes **Section 109.2**	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**) Initial Oil Characterisation (**Section 10.6**) Operational Water Quality Monitoring (**Section 10.7**) Shoreline Clean-up Assessment (**Section 10.8**)	Operations Section Chief Logistics Section Chief/ Supply Unit Leader Environment Unit Leader

When (indicative)	Activations		Who
	Objective	Action	
Activate on Day 1 for applicable scenarios	Source control support to stop the release of hydrocarbons into the marine environment. **Degree of IMT support will be scenario-dependent**	Go to **Section 9**	Operations Section Chief (Relief Well Team Leader as appropriate to scenario) Logistics Section Chief/ Supply Unit Leader
Activate on Day 1 for applicable scenarios Refer **Section 11**	Reduce exposure of wildlife to floating oil through mechanical dispersion	Activate the Mechanical Dispersion Plan Go to **Section 11**	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 Q: Forward operations guidance**	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 12**	Protect identified shoreline protection priorities	Activate the Shoreline Protection and Deflection Plan Go to **Section 12**	Operations Section Chief Logistics Section Chief /Supply Unit Leader Environment Unit Leader

<table>
<tr><th rowspan="2">When (indicative)</th><th colspan="2">Activations</th><th rowspan="2">Who</th></tr>
<tr><th>Objective</th><th>Action</th></tr>
<tr><td>If/when initiated
Refer Section 14</td><td>Prevent or reduce impacts to wildlife</td><td>Activate the Oiled Wildlife Response Plan
Go to Section 14</td><td>Environment Unit Leader
Operations Section Chief
Logistics Section Chief/ Supply Unit Leader</td></tr>
<tr><td>If/when initiated
Refer Section 15</td><td>Safely transfer, transport and dispose of waste collected from response activities.</td><td>Activate the Waste Management Plan.
Go to Section 15</td><td>Operations Section Chief
Logistics Section Chief/ Supply Unit Leader</td></tr>
<tr><td>If/when initiated
Refer Section 16</td><td>Assess and monitor impacts from spill and response</td><td>Activate the Scientific Monitoring Plan
Go to Section 16</td><td>Environment Unit Leader
Logistics Section Chief/ Supply Unit Leader
Operations Section Chief</td></tr>
<tr><td colspan="4">IMT Actions (48+ hours)</td></tr>
<tr><td>Ongoing</td><td colspan="2">+ 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 WA DoT (for a WA State waters response) is detailed in Section 4.6.1</td><td>Control agency IMT
Santos to provide the following roles to DoT Maritime Environmental Emergency Coordination Centre (MEECC) / IMT for WA State waters response (see Table 5-5):
+ CMT Liaison Officer
+ Deputy Incident Controller
+ Deputy Intelligence Officer
+ Deputy Planning Officer
+ Environment Support Officer
+ Deputy Public Information Officer</td></tr>
</table>

When (indicative)	Activations		Who
	Objective	Action	
			+ Deputy Logistics Officer + Deputy Waste Management Coordinator + Deputy Finance Officer + Deputy Operations Officer + Deputy Division Commander

3 Introduction

This document is the accompanying Oil Pollution Emergency Plan (OPEP) to the *Mutineer, Exeter, Fletcher, Finucane (MEFF) Cessation of Production Environment Plan (EP)* (9885-650-PLN-0001) required by Regulation 14(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS (E) Regulations).

3.1 Description of activity

Santos proposes to cease production of operations in the Operational Area, located in production licence area WA-26-L, WA-27-L and WA-54-L, located in Commonwealth Waters (**Figure 3-1**). Water depth in the vicinity of the well is 130–160 m.

Refer to Section 2 of the MEFF Cessation of Production EP (9885-650-PLN-0001) for full detail on the activity.

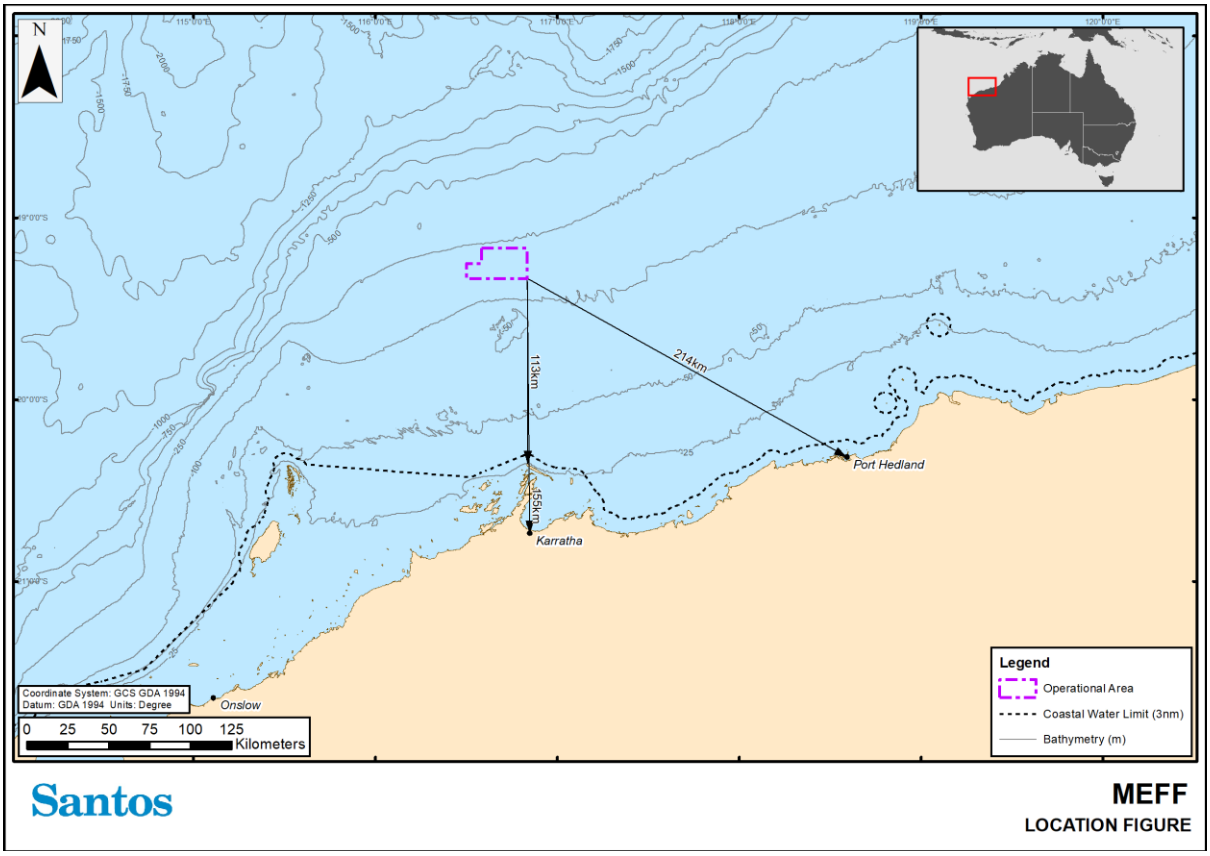

Figure 3-1: Operational Area

3.2 Purpose

The purpose of this OPEP is to describe Santos' response to a hydrocarbon spill during MEFF cessation of production activities.

This OPEP has been developed to meet all relevant requirements of the Commonwealth OPGGS (E) Regulations. 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, 2020a).

This OPEP is to be read in conjunction with the MEFF Cessation of Production EP (9885-650-PLN-0001) when considering the existing environment, environmental impacts, risk management, performance standards and the reporting compliance requirements.

This OPEP will apply from acceptance of the Santos MEFF Cessation of Production EP (9885-650-PLN-0001) and will remain valid for the duration of life of the EP.

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 NEBA process so the most effective response strategies with the lowest environmental consequences can be identified, documented and prepared for.

3.3 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.

3.4 Area of operation

The Mutineer-Exeter field is located approximately 160 km due north of Dampier on the north-west coast of Australia.

The field lies in permits WA-26-L (Mutineer), WA-27-L (Exeter) and WA-54-L (Fletcher-Finucane) in water depths ranging from approximately 130 m to 160 m (**Figure 3-1**). Section 3 of the MEFF Cessation of Production EP (9885-650-PLN-0001) includes a comprehensive description of the existing environment.

3.5 Interface with internal documents

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

- Incident Command and Management Manual (SO-00-ZF-00025)
- MEFF Cessation of Production EP (9885-650-PLN-0001)
- Incident Response Telephone Directory (SO-00-ZF-00025.020)
- Refuelling and Chemical Management Standard (QE-91-IQ-00098)
- Santos Offshore Source Control Planning and Response Guideline (DR-00-ZF-20001)
- Oil Pollution Waste Management Plan (QE-91-IF-10053)
- Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)
- Santos Oiled Wildlife Framework Plan (SO-91-BI-20014)
- Oil Spill Scientific Monitoring Plan (EA-00-RI-10099)
- Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)
- Oil Spill Scientific Monitoring Baseline Data Review (QE-00-BI-20001)
- Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001)
- Santos Offshore Division Oil Spill Response Readiness Guideline (SO-91-OI-20001).

3.6 Interface with external documents

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

- 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.
- HazPlan – SHP-MEE – Western Australia State Hazard Plan for Maritime Environmental Emergencies
  - 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
  - defines the steps, personnel, equipment and infrastructure required for the management of wildlife in an oil pollution response. Each region has a Regional Oiled Wildlife Response Plan that gives further details on sensitivities and available resources.
- 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 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.

3.7 Document review

In line with regulatory requirements, this document shall be reviewed, updated and submitted to NOPSEMA every five 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:

- 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.

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 State Hazard Plan for Maritime Environmental Emergencies (SHP- MEE) (WA DoT, 2020a). 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 Command and Management Manual (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 Incident Response Team (IRT) 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 facility spills.

To aid in the determination of a vessel versus a facility spill, the following guidance is adopted:

+ A vessel is a ship at sea to which 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 including a fixed platform, FPSO/FSO, 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 OPGGSA 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 MEFF Cessation of Production OPEP (this document)
	Petroleum activities[2]	NOPSEMA	Titleholder		MEFF Cessation of Production 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 Oil Spill Contingency Plan (OSCP) (WA DoT 2015) MEFF Cessation of Production OPEP (this document)
	Petroleum activities	WA DoT	Titleholder	WA DoT	MEFF Cessation of Production OPEP (this document) State Hazard Plan: Maritime Environmental Emergencies (WA DoT 2020a)

[1] Vessels are defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA, 2017) as a seismic vessel, supply or support vessel.

[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 OPGGSA 2006.

4.3 Petroleum activity spill in Commonwealth waters

For an offshore petroleum activity spill in Commonwealth waters, the jurisdictional authority is 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 (E) Regulations and the *OPGGS Act 2006*, 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.

Santos is responsible as control agency unless NOPSEMA identifies a requirement to delegate control. In this situation, control agency responsibility may be delegated to AMSA who will assume control of the incident and respond in accordance with AMSA's National Plan. In such an occurrence, Santos would assume a Support Agency role and make available all necessary resources to support AMSA in AMSA's performance of their control agency responsibilities.

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 State Hazard Plan for Maritime Environmental Emergencies (WA DoT, 2020a) and is the control agency for all level 2/3 vessel-based spills in WA waters.

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

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, material 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 Scientific Monitoring Plan **Section 16**).

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).

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). Control agency responsibilities will be determined by DoT and AMSA, with Santos providing all necessary resources (including personnel and equipment) as a supporting agency, as detailed in **Section 4.6.**

4.6 Integration with government organisations

4.6.1 Australian Maritime Safety Authority

Upon notification of an incident involving a ship, AMSA will assume control of the incident and response in accordance with AMSA's Marine Pollution Response Plan. AMSA's Marine Pollution Response Plan is the operational response plan for the management of ship-source incidents. AMSA is to be notified immediately of all ship-source incidents through RCC Australia (Santos Incident Response Telephone Directory (SO-00-ZF-00025.020)).

A memorandum of understanding (MoU) has been established between Santos and AMSA, outlining respective roles and responsibilities when responding to vessel-sourced marine pollution incidents and petroleum activity related marine pollution incidents.

AMSA manages the National Plan for Maritime Environmental Emergencies, Australia's key maritime emergency contingency and response plan. All resources under the National Plan are available to Santos through request to AMSA under the arrangements of the MoU.

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

In the event that a level 2/3 Marine Oil Pollution Incident enters, or has potential to enter, State waters, the Hazard Management Agency (HMA) (DoT Director General or proxy) will take on the role as the SMPC and DoT will take on the role as a Control Agency.

For any oil spill 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;
+ Evaluate 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/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 HMA will activate their MEECC and the DoT IMT.

For petroleum activity oil spills entering State waters (i.e. across jurisdictions) both Santos and DoT will be Control Agencies. Santos 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, 2020b), available online: DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements.

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 is completed. Appendix 1 in DoT's Offshore Petroleum Industry Guidance Note (WA DoT, 2020b) provides a checklist for formal handover.

For a cross-jurisdictional response, there will be a Lead IMT (DoT or Santos) for each spill response activity, with DoT's control resting primarily for State waters activities.

Appendix 2 in DoT's Offshore Petroleum Industry Guidance Note (WA DoT, 2020b) 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 FOB (see **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 Command 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.

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.

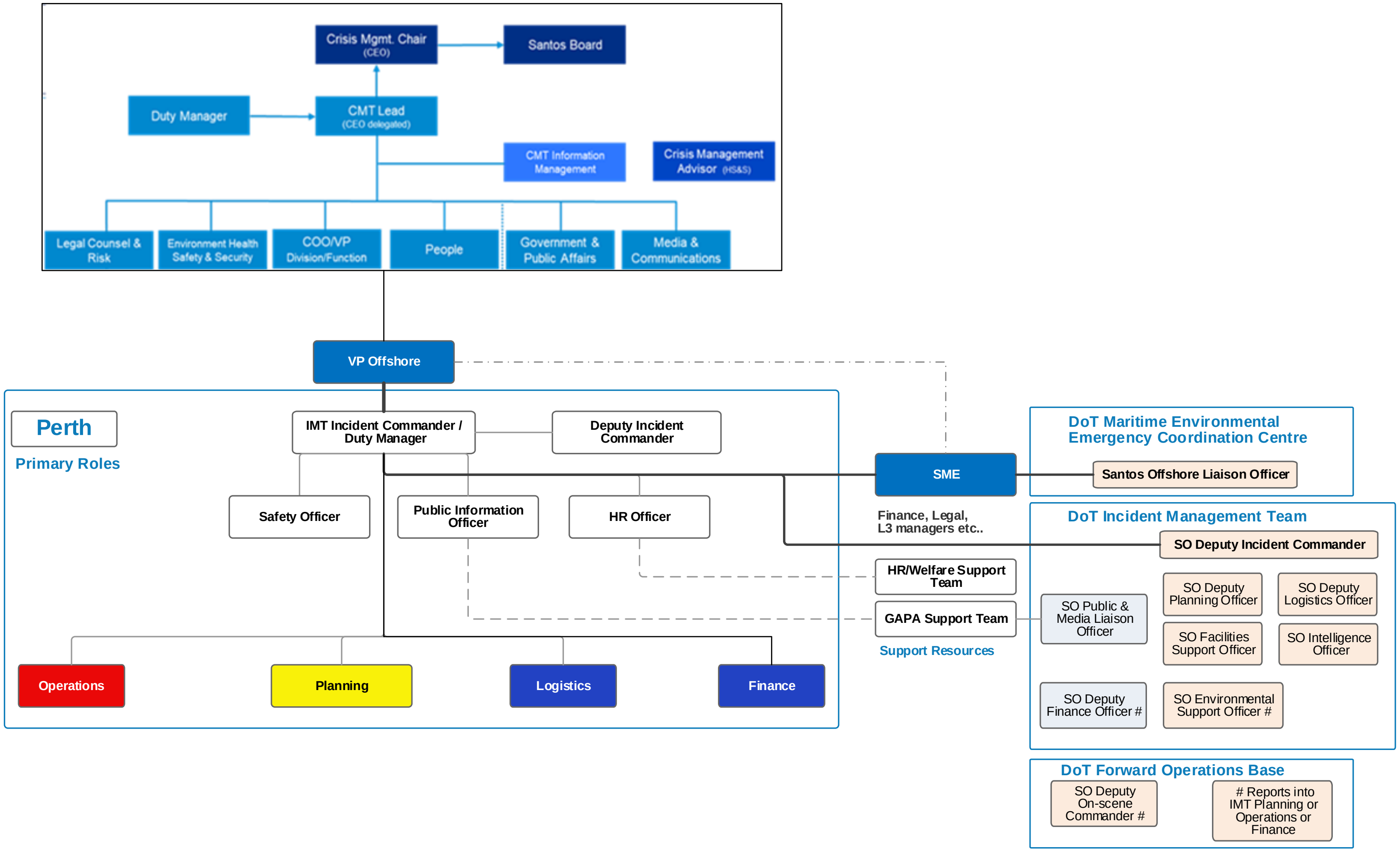

Figure 4-1: Santos cross-jurisdictional incident management structure for Commonwealth waters Level 2/3 facility oil pollution incident entering WA State waters

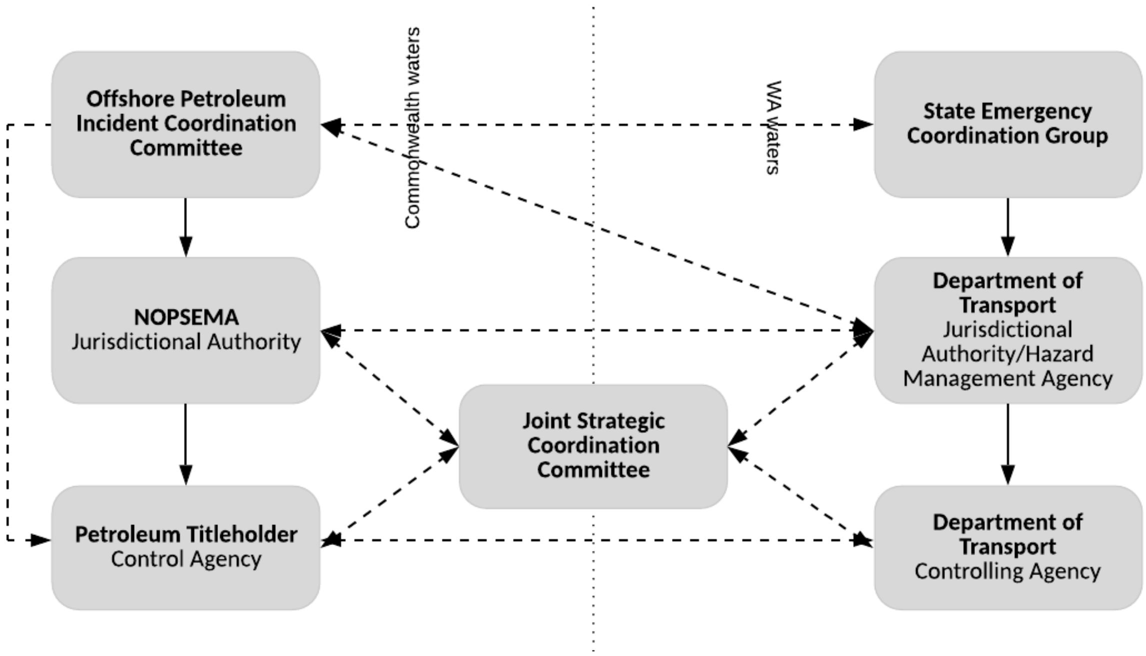

Figure 4-2: Overall control and coordination structure for offshore petroleum cross-jurisdiction incident

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) (DPAW & AMOSC, 2014) and regional sub-plans.

For a level 2/3 petroleum spill that originates within or 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.

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 scientific monitoring for impact and recovery assessment.

4.6.4 Department of Industry, Science, Energy and Resources

DISER 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). DISER 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 DISER 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 DISER 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 IRT.

4.7.1 Australian Marine Oil Spill Centre

Santos is a Participating Company of AMOSC and as such has access to AMOSC's Level 2/3 equipment and personnel as outlined in the AMOSPlan.

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. 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, BHP, Chevron and Woodside have signed a memorandum of understanding (MoU) that defines the group's mutual aid arrangements. Under this MoU, Santos, BHP, Chevron and Woodside 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.

Response equipment and personnel are allocated on a 50% of inventory basis under OSRL's Service Level Agreement.

5 Santos incident management arrangements

5.1 Incident management structure

The Santos IMT (Perth) and 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.

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 Command and Management Manual (SO-00-ZF-00025). The Incident Command and Management Manual describes 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 the formation of an IMT and establishment of an incident command centre (ICC). The ongoing involvement of the IMT and CMT will be dependent 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 a MEFF Cessation of Production incident includes:

+ Emergency Response Team
+ Santos IMT – Perth-based to coordinate and execute responses to an oil spill incident
+ Santos Crisis Management Team (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 within the OPEP.

The Santos incident response organisational structure is defined in the Incident Command and Management Manual (SO-00-ZF-00025) and in **Figure 5-1** for reference. 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 be comprised of the following sub-teams, according to the applicable source control strategies:

+ Relief Well Team
+ Well Intervention Team.

The Santos Source Control Branch (**Figure 5-2**) would report directly to the Operations Section Chief and would be responsible for:

+ Coordination of engineering safety and operational activities
+ Managing source control technical personnel from third parties (e.g. Wild Well Control)

- Developing task-specific plans and procedures
- Identification and sourcing of required tools and equipment
- Approving source control components of IAPs.

Santos

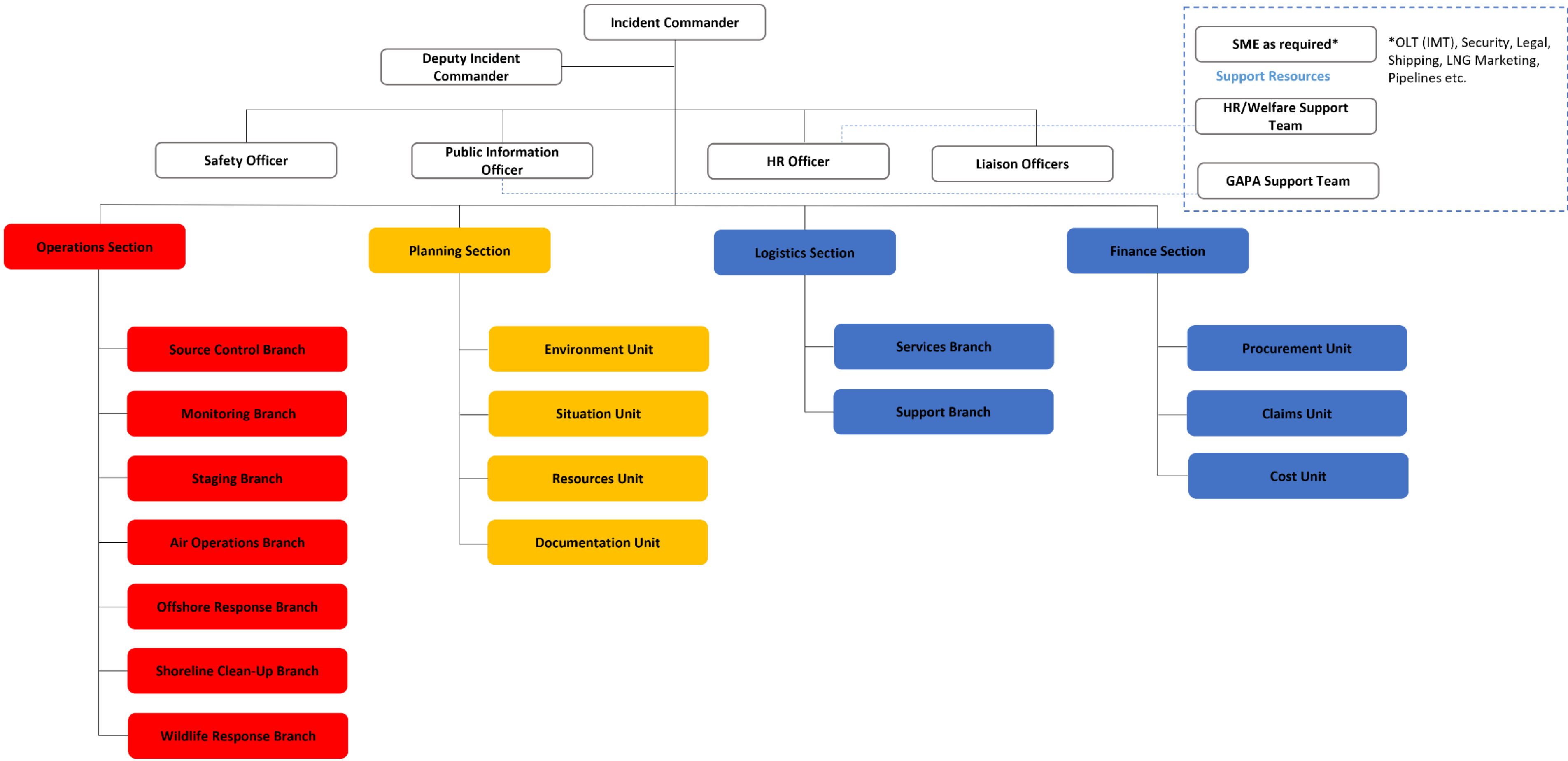

Figure 5-1: Santos incident management team organisational structure

Note: For a Level 2/3 facility spill whereby DoT is involved as a 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 4.6.2****.*

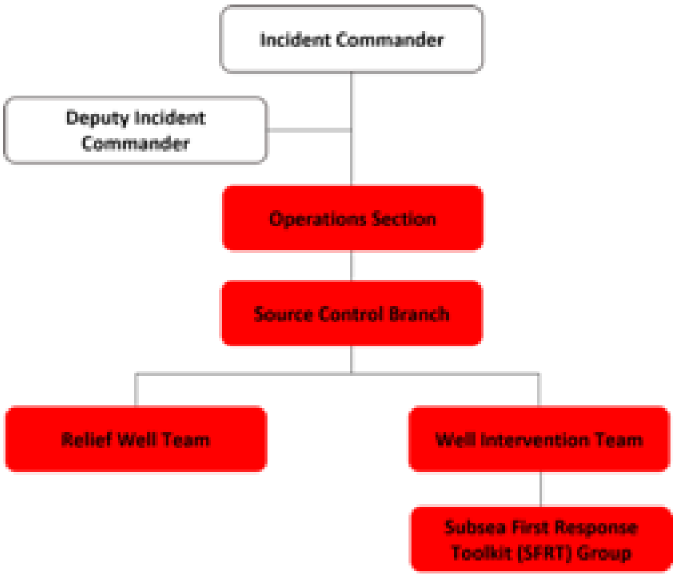

Figure 5-2: Santos Source Control Branch Structure

5.2 Roles and responsibilities

The following tables provide an overview of the responsibilities of the Santos CMT (**Table 5-1**), IMT (**Table 5-2**), and field-based response team members in responding to an incident (**Table 5-3**). Not all of the roles listed in **Table 5-2** are shown in **Figure 5-1**, as some of the roles in **Table 5-2** are support roles or specific to a particular response strategy. 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.

Also provided are the roles and responsibilities of Santos personnel required to work within DoT's organisational structure (**Table 5-5**), where DoT has responsibilities for spill response as a Control Agency, as per DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements.

DoT will provide a Liaison Officer/Duty Incident Commander and the Santos IMT in a coordinated response, as outlined for reference (**Table 5-4**).

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.

Santos CMT Role	Main Responsibilities
CMT Leader/ Duty Manager	The CMT Leader 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 Leader, Function Leaders, and CMST. + 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 Leader as follows: + Facilitates CMT activation requirements with the CMT Leader. + Assists the CMT Leader in maintaining an ongoing assessment of incident potential and analysis of stakeholder impacts. + Advises the CMT Leader on CMT structure and requirements for CMST engagement. + Coordinates tasks delegated by CMT Leader. + Provide tools to the CMT Leader for review and crisis assessment meetings.

Santos CMT Role	Main Responsibilities
CMT Core Function Leaders	CMT Core Function Leaders include Leaders for the following areas: + Legal Counsel and Risk, + Environment Health Safety and Security, + COO/VP Division/ Function, + People, + Government and Public Affairs, + Media and Communications The CMT Core Function Leaders 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 Leader 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 VPO is advised by the Incident Commander.
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	+ 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
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.
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
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.
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.
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
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.
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.

Santos Management/ IMT Role	Main Responsibilities
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.
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 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.

Santos Management/ IMT Role	Main Responsibilities
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
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

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

Field-based position	Main responsibilities
On-Scene Commander[3]	+ Assess facility-based situations / incidents and respond accordingly. + Single point of communications between facility/site and IMT. + Communicate the incident response actions and delegates actions to the Incident Commander. + Manage the incident in accordance with Facility Incident Response Plan, Third Party Incident Response Plan, and/or activity-specific Oil Spill Contingency Plan or Oil Pollution Emergency Plan. + Coordinate medical evacuations as required. + Refer to the Facility Incident Response Plan for detailed descriptions of roles and responsibilities.
Company Site Representative	+ Notify the Perth-based Incident Commander of oil spills. + Coordinate on-site monitoring of oil spill and ongoing communication with Incident Commander.

[3] The OSC is either the Santos Company Representative (if any on board) or the Vessel Master. Detail agreed during the activity planning stage.

Field-based position	Main responsibilities
Facility Incident Response Team (IRT)	+ Manage the incident in accordance with Facility Incident Response Plan, Third Party Incident Response Plan, and/or activity-specific Oil Spill Contingency Plan or OPEP + Coordinate forward operations response teams and activities for on-asset incidents + Refer to the facility Incident Response Plan for detailed descriptions of roles and responsibilities within the IRT.
Medical Evacuation Team	+ Manage all medical and transportation requirements related to injured personnel to an appropriate medical facility + Refer to the Medical Evacuation Procedure (QE-91-IF-00020) for detailed descriptions of roles and responsibilities within the Medical Evacuation Team
Off-Asset Oil Spill Response Teams	+ Respond to oil spills at sea to minimise the impacts to as low as reasonably practicable. + Refer to activity-specific Oil Spill Contingency Plans (OSCP) and OPEP for detailed descriptions of roles and responsibilities within the Off-Asset Oil Spill Response 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 Western Australia Oiled Wildlife Response Plan (WAOWRP) for detailed descriptions of roles and responsibilities within the Oiled Wildlife Response Team.
Monitoring Branch	+ Monitor the impacts and recovery to sensitive receptors from an oil spill and associated response actions. + Refer to the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162) 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)**	+ Facilitate effective communications between DoT's State Marine Pollution Coordinator (SMPC)/SMEEC/the Incident Controller and Santos' appointed CMT Leader/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.

DoT roles embedded within Santos' CMT/IMT	Main responsibilities
	+ 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

Santos roles embedded within the State MEECC/ DoT IMT	Main responsibilities
CMT Liaison Officer	+ Provide a direct liaison between the Santos CMT and the State MEECC. + Facilitate effective communications and coordination between the Santos CMT Leader 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. + 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.

Santos roles embedded within the State MEECC/ DoT IMT	Main responsibilities
	+ 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[4]	+ 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. + 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. + 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.

[4] In the event of an incident, access to media and communications response strategy and a comprehensive stakeholder list inclusive of all potentially relevant stakeholders, including indigenous organisations are contained via Santos' internal intranet site for use by CMT/IMT members

Santos roles embedded within the State MEECC/ DoT IMT	Main responsibilities
	+ 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; + Collects 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 FOB Operations Commander. + Offer advice to the DoT FOB Operations Commander on matters pertaining to Santos incident response policies and procedures.

Santos roles embedded within the State MEECC/ DoT IMT	Main responsibilities
	+ 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 and government mandate boarder restrictions (e.g. Covid-19).

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 Operations Section Chief / Source Control Branch Director	One Level 3 exercise annually or two Level 2 exercises annually[5]	+ PMAOMIR320 + PMAOMIR418 + AMOSC – IMO3 Oil Spill Command and Control

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

IMT Role	Exercise	Training
Planning Section Chief Logistics Section Chief Environment Unit Leader		+ PMAOMIR320 + AMOSC – IMO2 Oil Spill Management Course
Safety Officer Supply Unit Leader GIS Team Leader Data Manager[6] HR Officer		+ PMAOMIR320 + 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

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 Oil Spill Operators Course	12
Santos Facility Emergency Response Teams	Present at Facility for first-strike response to incidents.	Internal Santos training and exercises as defined in each facility's Emergency Response Plan OSC to have AMOSC – Oil Spill Response Familiarisation Training.	One Incident Response (IR) 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 tri-annually).	7

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

Responder	Role	Training	Available Number
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 Oil Spill Operators Course and/or IMO2 Oil Spill Management Course	As defined in Core Group Member Reports[7] Target to maintain at least 84 members (Ref.: AMOSC Core Group Program and Policies)
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
AMOSC Staff	Professionals, providing technical, incident management and operational advice and assistance available under Santos-AMOSC contract.	As per AMOSC training and competency matrix.	15
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
Oiled Wildlife Response Roles	Refer **Section 14** and **Appendix M: Oiled wildlife response personnel and equipment**		
Monitoring Service Provider: Monitoring Coordination Team (MCT) and Scientific Monitoring Plan Teams	Monitoring Coordination Team (MCT) Scientific Monitoring Plan Teams: Technical Advisers Field Team Leader Field Team Member	As defined in the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)	Capability defined in Monthly Capability Reports. MCT – five personnel Scientific Monitoring Plan Teams 12+ per team
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.		

[7] An average of 39 personnel plus 15 AMOSC staff members available as of December 2021.

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, will be deployed under the direction of AMOSC and the IMT 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, 2013).
+ WA State Hazard Plan for Maritime Environmental Emergencies (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 State Hazard Plan (SHP-MEE) requirements.

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 operational monitoring, shoreline protection, shoreline clean-up, oiled wildlife response and scientific monitoring.

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;

1. Review
2. Audit
3. Equipment Checks/ Deployments
4. Desktop Exercise
5. 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 (SO-91-OI-20001); an excerpt of the testing arrangements plan is provided in **Figure 5-3**. 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).

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
1	**Source Control**				
	Source Control a) Relief Well Drilling - Access to MODU	Review - MODU Register	Once per month for the duration of drilling campaign	Identify suitable MODU that can be utilized in the event of a Source control incident requiring a relief well	Document the identified suitable MODU by: •Name •MODU Type •Location •Contract Status
	Source Control b) Well Capping - Access to Capping Stack	Review - Contract/Agreement	Annually (when drilling activity is occurring)	To confirm access to capping stack for well capping	Review to confirm access to Capping Stack through maintenance of service provision contract
	Source Control c) Access to Source Control Emergency Response Personnel	Desktop Exercise	Annually (when drilling activity is occurring)	To check arrangements for access to Well Control Specialists from WWC as per Source Control Planning and Response Guideline DR-00-OZ-20001	Confirmation (email) from WWC that listed Well Control specialists can be made available and will be mobilized within 72 hours of a notification
	Source Control d) Vessel Fuel Tank Rupture - SOPEP	Review - Plan	Prior to vessel arrival in field	To confirm that each vessel within the field has an approved SOPEP in place	Review to confirm approved SOPEP in place for vessels
2	**Operational Monitoring**				
	Operational Monitoring - Vessel Surveillance a) Access to vessels	Review - Contract/Agreement	Annually	To confirm access to vessels for surveillance	Review to confirm Master Service Agreements (MSAs) with vessel providers to gain access to vessels
	Operational Monitoring - Aerial Surveillance a) Access to aircrafts	Review - Contract/Agreement	Annually	To confirm access to aircrafts for surveillance	Review to confirm Master Service Agreements (MSAs) with aircraft providers to gain access to aircrafts for surveillance
	Operational Monitoring - Aerial Surveillance b) Access to trained aerial observers	Review - Contract/Agreement	Annually	To confirm access to trained aerial observers	Review to confirm access to trained aerial observers through; •Trained Santos personnel or •AMOSC Member Contract or •OSRL Associate Member Contract

Figure 5-3: Excerpt of testing arrangement plan, taken from Santos Offshore Oil Spill Response Readiness Guideline (SO-91-OI-20001)

All testing activities are documented, and all reports generated will be saved in Santos's EHS Toolbox system 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.

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 Assurance Schedule (E-910HA-20002). 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.

The deployment readiness and capability of AMOSC's oil spill response equipment and resources in Geelong and Fremantle 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 MEFF cessation of production activities. Of the credible spill scenarios identified in the MEFF Cessation of Production EP (Sections 7.5), all have been selected to represent worst-case spills from a response perspective, taking into account the following characteristics:

+ They represent all hydrocarbon types that could be spilt during MEFF Cessation of Production activities.
+ They represent maximum credible release volumes.
+ Those scenarios that represent 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, State/Commonwealth boundaries etc.

The worst-case credible spill risks selected to inform this OPEP are presented in **Table 6-1.** The MEFF Cessation of Production EP (Sections 7.5 to 7.7) details the derivation of these maximum credible spills.

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

Table 6-1: Maximum credible spill scenarios for MEFF cessation of production activities

Worst-case credible spill scenario	Approx. depth of spill	Hydrocarbon type	Maximum credible volume released (m^3)	Release duration
LOWC – subsea release	162 m	Light crude oil	1,350	126 days
Surface diesel release	0 m	MDO	604	20 minutes

6.2 Response planning thresholds

Environmental impact assessment thresholds are addressed in Section 7.5.4 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 (e.g. chemical dispersant application) 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: Surface hydrocarbon thresholds for response planning

Hydrocarbon concentration (g/m^2)	Description
>1	Estimated minimum threshold for commencing some scientific monitoring components (see **Appendix N: Scientific monitoring plans**)
>50	Estimated minimum floating hydrocarbon threshold for containment and recovery and surface dispersant application *Note: Containment and recovery and surface dispersant application are not applicable spill response strategies under this OPEP.*
>100	Estimated floating hydrocarbon threshold for effective containment and recovery and surface dispersant application Estimated minimum shoreline accumulation threshold for shoreline clean-up *Note: Containment and recovery, surface dispersant application and shoreline clean-up are not applicable spill response strategies under this OPEP.*

6.3 Stochastic spill modelling results

As detailed in Sections 7.5.3.1 of the EP, modelling was conducted using a hydrocarbon analogue (SINTEF's Vale) to represent Mutineer-Exeter Crude. Across properties influencing weathering behaviour (e.g. density, boiling point curve, pour point) Vale and Mutineer-Exeter Crude are well matched (see Section 7.5.3.1 of the EP). The specific gravity/ API of the modelling analogue Vale is close to that of Mutineer-Exeter Crude. Vale has a higher proportion of heavier, more persistent components and is therefore a more conservative selection in this regard. Asphaltene content is an exact match and wax content is a very close match. These parameters are key drivers of emulsification potential, since emulsification increases with the proportion of these parameters, especially over a threshold >0.5% for asphaltene content (CSIRO, 2016).

Comparative distillation curves of Vale and Mutineer-Exeter Crude match very closely (GHD, 2021). On this basis, and in view of the similarity in other factors influencing weathering and persistence in the environment (refer Section 7.5.3.1 of the EP), the modelling conducted is considered representative of how Mutineer-Exeter Crude would behave in the environment.

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.

Modelling results for dissolved and entrained oil for the worst-case scenarios have not been included in this OPEP given there are limited response strategies that will reduce subsurface impacts. See Section 7.5.4 of the EP for dissolved and entrained thresholds and Sections 7.7.3 and 7.8.4 for impacts to receptors.

The worst-case shoreline loading and/or probability of total contact at more than 1 g/m^2 (percentage) for all emergent and intertidal receptors is presented in **Table 6-3** and **Table 6-4**. For each scenario, these results represent the worst loading or floating oil contact probability for each receptor from all stochastic modelling runs (150 simulations) across all seasons. No shoreline contact >100 g/m^2 was predicted to occur for the LOWC scenario at any shoreline, therefore a summary of predicted contact >10 g/m^2 is also provided.

Table 6-3: Worst-case spill modelling results – Mutineer-Exeter Cessation of Production subsea LOWC (GHD, 2021)

Location	Total contact probability (%) floating oil >1 g/m²	Minimum arrival time floating oil >1 g/m² (days)	Total probability (%) shoreline oil accumulation> 10 g/m²	Minimum arrival time shoreline oil accumulation >10 g/m² (days)	Maximum total accumulated oil ashore (tonnes) >10 g/m²	Total probability (%) shoreline oil accumulation >100 g/m²	Minimum arrival time shoreline oil accumulation >100 g/m² (days)	Maximum total accumulated oil ashore (tonnes) >100 g/m²	Maximum length of shoreline oiled (km) >100 g/m²
Clerke Reef MP*	NC	NC	15.3	24.5	0.2	NC	NC	NC	NC
Imperieuse Reef MP*	NC	NC	50.7	14.3	0.8	NC	NC	NC	NC
Southern Islands Coast	NC	NC	5.3	26.5	0.1	NC	NC	NC	NC
Muiron Islands	NC	NC	6.0	23.3	0.1	NC	NC	NC	NC
Ningaloo Coast North	NC	NC	0.7	79.3	<0.1	NC	NC	NC	NC

**Predominantly intertidal receptor apart from small dry emergent areas*

Table 6-4: Worst-case spill modelling results – vessel collision (marine diesel oil) (GHD, 2021)

Location	Total contact probability (%) floating oil >1 g/m²	Minimum arrival time floating oil >1 g/m² (days)	Total probability (%) shoreline oil accumulation >10 g/m²	Minimum arrival time shoreline oil accumulation >10 g/m² (days)	Total probability (%) shoreline oil accumulation >100 g/m²	Minimum arrival time shoreline oil accumulation >100 g/m² (days)	Maximum total accumulated oil ashore (tonnes) >100 g/m²	Maximum length of shoreline oiled (km) >100 g/m²
Clerke Reef MP*	NC	NC	0.3	14.7	NC	NC	NC	NC
Imperieuse Reef MP*	0.3	16.3	1.5	10.0	0.5	11.7	12.4	11.0
Southern Islands Coast	NC	NC	0.3	10.8	NC	NC	NC	NC
Glomar Shoals	2.0	0.4	NC	NC	NC	NC	NC	NC
Montebello AMP	0.3	4.8	NC	NC	NC	NC	NC	NC
Rowley Shoals surrounds	2.8	6.8	NC	NC	NC	NC	NC	NC
Ningaloo – Offshore	0.8	4.8	NC	NC	NC	NC	NC	NC

**Predominantly intertidal receptor apart from small dry emergent areas*

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 a 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
		Mutineer-Exeter Crude	MDO	
Source Control	Spill kits	✓ 1	✓ 1	Relevant for containing spills that may arise onboard a vessel.
	Secondary containment	✓ 1	✓ 1	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.
	Shipboard Oil Pollution Emergency Plan	✗	✓ 1	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.
	Capping stack	✗	✗	The suspended/shut-in wells are fitted with Christmas 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 or Lower Marine Riser Package, providing a temporary 'tree' to close in an uncontrolled flow. As the suspended/shut in wells already have a Christmas Tree installed, the Capping Stacks provide no additional function.
	Relief well drilling	✓ 1	✗	Relevant to LOWC. Relief well drilling is the primary method for killing the blowing well. To be conducted as per the Source Control Emergency Response Plan (DR-00-OZ-20001) and Well-specific Source Control Plan.
In-Situ Burning	Controlled burning of oil spill	✗	✗	Not applicable to wells with light hydrocarbons due to safety hazards. Not applicable to diesel spills due to inability to contain marine diesel making it very difficult to maintain necessary slick thickness for ignition and sustained burning.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Mutineer-Exeter Crude	MDO	
Monitor and Evaluate Plan (Operational Monitoring)	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. 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.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Mutineer-Exeter Crude	MDO	
				May not be 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.
	Operational Water Quality Monitoring	✓ 1	✓ 1	Fluorometry surveys are used to determine the location and distribution of the entrained oil and dissolved aromatic hydrocarbon components of a continuous subsea spill and validate the spill fate modelling predictions.
	Shoreline Clean-up Assessment	N/A	✓ 1	*Mutineer-Exeter Crude* N/A – modelling indicates no shoreline contact above 100 g/m^2. *Marine Diesel* Provides information on shoreline oiling (state of the oil, extent of pollution, etc). Can provide information on amenability of shoreline response options (e.g. clean-up, protect and deflect). Provides information on status of impacts to sensitive receptors. Considerable health & safety considerations. Requires trained observers. Constrained to daylight. Delayed response time.
Chemical dispersion	Vessel Application	✗	✗	*Mutineer-Exeter Crude*

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Mutineer-Exeter Crude	MDO	
	Aerial Application	✗	✗	Spill modelling of the subsea LOWC scenarios did not predict the formation of a surface slick at concentrations exceeding 50 g/m^2, which is typically considered the lowest threshold for effective surface dispersant application.
	Subsea dispersant injection (SSDI)	✗	✗	SSDI is known to 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 and selection of relief well as the primary source control option, VOCs are not expected to affect responders and source control personnel. A potential drawback of this 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). Considering the low 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 SSDI. *Marine Diesel* Marine diesel is not considered a persistent hydrocarbon and has high natural dispersion rates in the marine environment. Chemical dispersant application is not recommended as a beneficial option for diesel as it has a low additional benefit of increasing the dispersal rate of the spill while introducing the potential for more chemicals into the marine environment.
Offshore Containment and Recovery	Use of offshore booms/ skimmers or other collection techniques deployed from vessel/s to contain and collect oil	✗	✗	*Mutineer-Exeter Crude* Spill modelling of the subsea LOWC scenarios did not predict the formation of a surface slick at concentrations exceeding 50 g/m^2, which is typically considered the lowest threshold for effective containment and recovery operations. *Marine Diesel* Not suitable for marine diesel given its rapid weathering nature. Marine diesel spreads quickly to a thin film, making recovery via skimmers difficult and ineffective.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Mutineer-Exeter Crude	MDO	
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 that 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. 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 vessels undertaking primary strategies may be used opportunistically.
Protection and Deflection	Booming in nearshore	✗	✓ 2	Considered if operational monitoring shows or predicts contact with sensitive shorelines. *Mutineer-Exeter Crude* Modelling indicates no shoreline contact above moderate shoreline accumulation thresholds (>100 g/m^2).

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Mutineer-Exeter Crude	MDO	
	waters and at shorelines			*Marine Diesel* Modelling shows very low probability of contact with shorelines and minimal shoreline accumulation >100 g/m^2. Shoreline protection and deflection activities can result in physical disturbance to intertidal and shoreline habitats. Given the relatively small volumes predicted to come ashore, and the high rates of natural biodegradation of marine diesel, it would be better to focus on the priority area for protection. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where priority protection areas are at risk of impact from marine diesel.
Shoreline clean-up	Activities include physical removal, surf washing, flushing, bioremediation, natural dispersion	✗	✓ 2	Considered if operational monitoring shows or predicts contact with sensitive shorelines. *Mutineer-Exeter Crude* Modelling indicates no shoreline contact above moderate shoreline accumulation thresholds (>100 g/m^2). *Marine Diesel* Modelling shows 0.5% probability of shoreline accumulation at more than 100 g/m^2. Shoreline clean-up activities can result in physical disturbance to shoreline habitats. Given the relatively small volumes predicted to come ashore, and the high rates of natural biodegradation of marine diesel, it would be better to focus on high priority areas for clean-up. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where protection priority areas are at risk of impacts from marine diesel.
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 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.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Mutineer-Exeter Crude	MDO	
Scientific Monitoring	The monitoring of environmental receptors to determine the level of impact and recovery from the oil spill and associated response activities	✓ 1	✓ 1	Monitoring activities include: + water and sediment quality + biota of shorelines (sandy beaches, rocky shores and intertidal mudflats) + mangrove monitoring + benthic habitat monitoring (seagrass, algae, corals, non-coral benthic filter feeders) + seabirds and shorebirds + marine megafauna (incl. whale sharks and mammals) + marine reptiles (incl. turtles) + seafood quality + fish, fisheries and aquaculture The type and extent of scientific monitoring will depend upon the nature and scale of oil contact to sensitive receptor locations as determined through operational monitoring. Pre-defined initiation criteria exist for scientific monitoring plans associated with marine and coastal sensitivities.

6.5 Identify priority protection areas and initial response priorities

Combined spill modelling results were used to predict the Environment that may be Affected (EMBA) for MEFF Cessation of Production (refer to Section 3.1.2 – MEFF Cessation of Production EP [9885-650-PLN-0001]). The EMBA is the largest area within which effects from hydrocarbons spills associated with this activity, could extend. Within the EMBA, Santos has determined Hot Spots (key areas of high ecological value that have the greatest potential to be impacted by a MEFF Cessation of Production spill) for which detailed oil spill risk assessment has been conducted (refer Section 7.5.5 of the MEFF Cessation of Production EP). From these Hot Spot areas, priority protection areas for spill response have been identified (as per Section 7.5.5.4 of the MEFF Cessation of Production EP [9885-650-PLN-0001]). Priority protection areas are emergent features (i.e. coastal areas and islands) that would be targeted by nearshore spill response operations such as protection and deflection and shoreline clean-up.

Imperieuse Reef Marine Park was the only protection priority identified from a MEFF Cessation of Production spill with shoreline accumulation above 100 g/m^2 from the MDO spill scenario. The subsea loss of well control did not result in any shoreline contact from floating oil above 50 g/m^2 or shoreline accumulation above 100 g/m^2 (**Table 6-3**).

Table 6-6 lists the key sensitivities within the Imperieuse Reef Marine Park. The ranking of these sensitivities (also referred to as receptors) are listed, which is consistent with the rankings in *Provision of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 2: Pilbara* (DoT, 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 6-6**. 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.

Table 6-6: Initial response priorities, Mutineer-Exeter Cessation of Production Spill

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[8]	DoT Ranking (Dissolved oil)	Key locations	Relevant key periods	Maximum total accumulated oil ashore (tonnes) >100 g/m²	Minimum arrival time accumulated oil ashore >100 g/m² (days)	Initial response priority
Imperieuse Reef MP	Turtles Green turtles (Vulnerable) and hawksbill turtles (Vulnerable) known to be present – not regionally significant habitat	2	1	N/A	N/A	MDO spill: 12.4	MDO spill: 11.7	Medium
	Marine mammals Humpback whale migration	2	1	N/A	Humpback whale migration: Jun to Jul			Low
	Birds Wide range of seabirds observed	2	1	N/A	N/A			Medium
	Coral and other subsea benthic primary producers	3	4	N/A	Coral spawning: Mar & Oct			Medium
	Socioeconomic Tourism – charter boats, diving and snorkelling Recreational fishing (limited numbers due to distance from coast)	1	1	N/A	Tourism: Sep to Dec			Low

[8] Provision of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 2: Pilbara (DoT, 2017).

6.5.1 Tactical Response Plans for Priority Protection Areas

Tactical Response Plans (TRPs) have been developed for selected receptors (**Table 6-7**), 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 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 hydrocarbon be considerable (high accumulation, large floating oil contact). 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 operators where possible.

Table 6-7: Tactical Response Plans for Priority Protection Areas for the MEFF Cessation of Production activities based on vessel collision oil spill modelling

PPA	TRP Evaluation	Existing TRP
Imperieuse Reef MP	A full TRP already exists for: + Imperieuse Reef	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.

The Environment Unit Leader will use the information in **Section 6.5** 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, 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 both the LOWC and vessel spill scenarios, with the benefit or potential impact to each sensitivity identified (refer **Table 6-8**).

In the event of a spill, NEBA is applied with supporting information collected as part of the Operational Monitoring 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 6-6**).
- Assist in determining appropriate response strategies with support of real-time metocean conditions, oil spill tracking and fate modelling.

When a spill occurs, 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.

Table 6-8: Strategic net environmental benefit analysis matrix – MEFF Cessation of Production (all scenarios)

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Mechanical Dispersion	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Imperieuse Reef MP							
Turtle habitat – green, hawksbill							
Coral and other subsea benthic primary producers					N/A	N/A	
Marine mammals – humpback whale migration							
Seabirds							
Tourism – charter boats, diving, snorkelling, recreational fishing							

Legend	
	Beneficial impact.
	Possible beneficial impact depending on the situation (e.g. time frames and metocean conditions to dilute entrained oil).
	Negative impact.
N/A	Not applicable for the environmental value or not applicable for hydrocarbon type

6.7 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: ALARP Assessment Framework 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 Safety Officer and the Environment Unit Leader.

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 outlined within this OPEP 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 (Rescue Coordination Centre) 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.

The Incident Response Telephone Directory (SO-00-ZF-00025.02) contains a more detailed list and contact details for incident response support and is updated every 6 months with up-to-date revisions available within the IMT room and online (intranet procedures and emergency response pages).

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-00025.02) contains a more detailed list and contact details 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 and measurement criteria for external notifications and reporting.

Table 7-1: External notification and reporting requirements (Commonwealth, state and international waters)

Agency or Authority	Type of notification/ timing	Legislation/guidance	Reporting requirements	Responsible person/group	Forms
NOPSEMA reporting requirements for Commonwealth water spills					
NOPSEMA (Incident Notification Office)	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 2009 (as amended 2014)	A spill associated with the activity in Commonwealth waters that has the potential to cause moderate to significant environmental damage[1]	Notification by Environment Unit Leader (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 Environment Unit Leader (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	Santos to notify AMSA of any marine pollution incident[1]	Notification by Environment Unit Leader (or delegate)	Not applicable
Commonwealth Department of Agriculture, Water and the Environment (DAWE) (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 Environment Unit Leader (or delegate)	Not applicable

Agency or Authority	Type of notification/ timing	Legislation/guidance	Reporting requirements	Responsible person/group	Forms
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 an Australian Marine Park	Notification by Environment Unit Leader (or delegate)	Not applicable, but the following information should be provided: + Titleholder's details + 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 pollution[1] Fisheries within the environment that may be affected (EMBA)	Notification by Environment Unit Leader (or delegate)	Not applicable

Agency or Authority	Type of notification/ timing	Legislation/guidance	Reporting requirements	Responsible person/group	Forms
			Consider a courtesy call if not in exposure zone		
If spill is heading towards WA waters					
Department of Mines, Industry Regulation and Safety (DMIRS) (Petroleum Environment Duty Officer)	Verbal phone call within two hours of incident being identified Follow up written notification within three days	Guidance Note on Environmental Non-compliance and Incident Reporting	All actual or impending spills in State waters	Notification by Environment Unit Leader (or delegate)	Environmental and Reportable Incident/ Non-compliance Reporting Form http://www.dmp.wa.gov.au/Environment/Environment-reports-and-6133.aspx
WA Department of Transport (WA DoT)[2] (MEER Duty Officer)	Verbal notification within two hours Follow up with Pollution Report (**Appendix C: Pollution report**) as soon as practicable after verbal notification If requested, submit Situation Report (**Appendix D: Situation report**) within 24 hours of request	*Emergency Management Regulations 2006* State Hazard Plan: Maritime Environmental Emergencies Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements	Santos to notify of actual or impending Marine Pollution Incidents (MOP) that are in, or may impact, State waters 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]	Notification by Environment Unit Leader (or delegate) MEER Duty Officer contacted per Incident Telephone Directory	WA DoT POLREP (**Appendix C: Pollution report**): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf WA DoT SITREP (**Appendix D: Situation report**): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf

Agency or Authority	Type of notification/ timing	Legislation/guidance	Reporting requirements	Responsible person/group	Forms
Department of Biodiversity Conservation and Attractions (State Duty Officer)	Verbal notification within two hours	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 Environment Unit Leader (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 Environment Unit Leader (or delegate)	Not applicable

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) and, in State waters, WA DoT MEER.

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 Manager	As soon as possible but within two hours of incident having been identified	Verbal Service Contract	Santos is a Participating Company in 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	**Step 1.** Obtain approval from Incident Commander to mobilise AMOSC. **Step 2.** Notify AMOSC that a spill has occurred. Put on standby as	Environment Unit Leader (or delegate) will notify AMOSC (upon approval from Incident Commander)

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
			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	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, and call-out authorities will be required to supply their credentials to AMOSC. A signed service contract must also be completed by a call-out authority and returned to AMOSC before mobilisation.	
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, BHP, Chevron)**	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)

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
North West Alliance–Waste	As required for offshore and shoreline clean-up activities	Verbal	Santos has contract arrangements in place with North West Alliance 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)
Astron	Scientific Monitoring Plan initiation criteria are met (Appendix N: Scientific monitoring plans)	Verbal and written	Astron has been contracted by Santos to provide Standby Services for Scientific Monitoring Plans (SMPs) 1 to 11. This includes provision of personnel and equipment. Astron annually reviews the SMPs for continual improvement	**Step 1.** Obtain approval from Incident Commander to activate Astron for Scientific Monitoring. **Step 2.** Verbally notify Astron followed by the submission of an Activation Form (Environment Unit Leader Folder) via email. **Step 3.** Provide additional details as requested by the Astron Monitoring Coordinator on call-back. **Step 4**. Astron initiates Scientific Monitoring Activation and Response Process.	Environment Unit Leader (or delegate)
Intertek Geotech (WA) Environmental Services and Ecotoxicology	When characterisation of oil is activated (**Section 10.6**)	Verbal	Oil analysis including gas chromatography/mass spectrometry fingerprinting	Phone call.	Environment Unit Leader (or delegate)
Oil Spill Response Limited, OSRL Duty Manager	Within two hours of incident having been identified	Verbal OSRL Mobilisation	Santos has a Service Level Agreement with OSRL, which includes the provision of support	**Step 1**. Contact OSRL Duty Manager in Singapore and request assistance from OSRL.	Designated call-out authorities (including Incident Commanders)

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
		Authorisation Form	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 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.	
RPS Group	As soon as possible but within two hours of incident having been identified	Verbal and written	Santos has an agreement in place with RPS Group to allow rapid marine hydrocarbon spill modelling capability to 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	Contact RPS Group Duty Officer.	Environment Unit Leader (or delegate)
Wild Well Control (WWC)	Within four hours of a loss of well control incident having been identified	Loss of well control only Verbal	Well intervention services. Under contract.	**Step 1**. Following Santos management confirmation of a loss of well control (LOWC), Source Control Branch Director is to call the Wild Well Control 24-hour emergency hotline number to notify WWC of the incident. **Step 2**. As soon as practical after initial notification and once the	Source Control Branch Director

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
				scale of the subsea loss of containment is confirmed, an emergency mobilisation authorisation form (saved in ECM) must be filled out, signed off by the authorised Santos Manager sent through to WWC. The form is located on the Santos Intranet Procedures Index under Emergency Procedures (http://ausintranet.enerylimited.com/dept_data/Procedure_data/index.htm). Email as directed by WWC point of contract provided by the emergency hotline attendant.	

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**	**Measurement criteria**
External notifications and reporting plan	**Response preparedness**		
	Santos Incident Response Telephone Directory (SO-00-ZF-00025.020)	Incident Response Telephone Directory is revised every six months	Document revision history
	OPEP communications test	OPEP contact details for regulatory and service provider notifications are checked annually	Test records
	Response implementation		
	External notifications and reporting tables	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**.

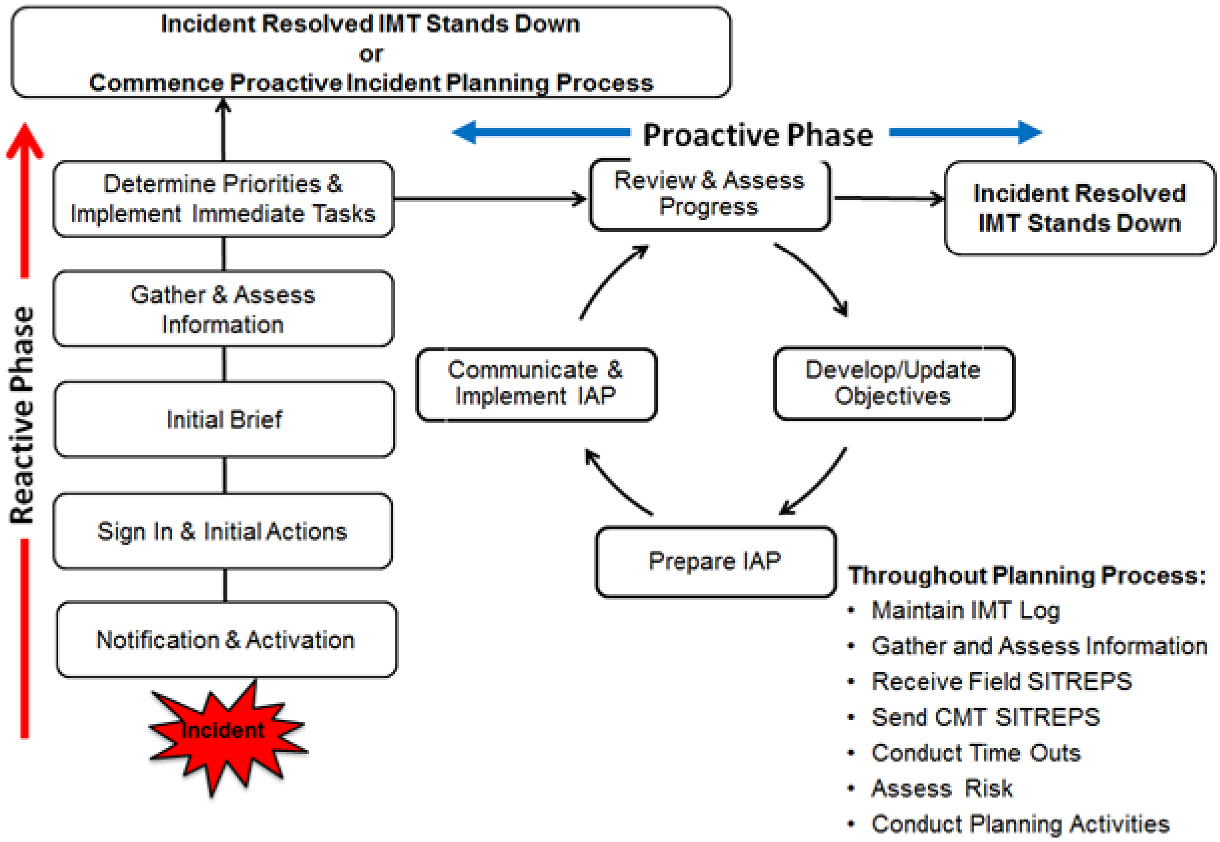

Figure 8-1: Incident action plan process

8.1.1 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 **Section 2** and provide links to relevant oil spill strategy sections within the OPEP which contain a more detailed list of implementation actions and considerations as well as statements of performance (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. This pre-planning is included in the activity-specific OPEP Addendums. 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.

8.1.2 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 *Incident Command and Management Manual* (SO-00-ZF-00025) and in the 'Emergency Response' folder sets at *L:\Resource\Emergency Response\Incident-Exercise Number-Name*. Begin the response by copying and saving *Incident-Exercise Number-Name* folder set with a unique incident name and Id number on the lead folder; this is the Incident log. Access subfolders to display all forms required to conduct incident action planning. Each functional position within the IMT and CMT has subfolders carrying forms and processes unique to the functional position.

8.1.3 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**	**Measurement criteria**
Incident action planning	**Response preparedness**		
	IMT Exercise and Training Plan	Incident action planning and NEBA is practiced by the IMT during exercises	Exercise records
	Tactical Response Plans	If operational monitoring 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
	Response implementation		
	Incident action plan	Incident action plan is completed for each operational period and approved by the Incident Commander	Incident log Incident action plan/s
		Monitor effectiveness of response strategies being implemented and use information in the development of IAPs	Incident log Incident action plan/s
	NEBA	An operational NEBA will be undertaken for each operational period of the incident	NEBA Incident action plan
	IMT activation and de-escalation	IMT will be activated Immediately once notified of a level 2/3 spill (to Incident Commander).	Incident Action Plan

Environmental performance outcome	Manage incident via a systematic planning process		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
		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

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

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

The sections below provide an outline of source control activities noting that the Vessel SOPEP and Source Control Planning and Response Guideline (DR-00-ZF-20001), where applicable, will 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: Vessel collision – source 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	Notification of a spill	
Applicable hydrocarbons	**MDO**	**Crude**
	✓	✗
Termination criteria	Release of oil to the marine environment has ceased and the workplace environment is deemed environmentally safe and free of hydrocarbons	

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, the relevant vessel-specific procedures will be applied. For support 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 well leak.

Table 9-3: Loss of well control – source 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	LOWC	
Applicable hydrocarbons	**MDO**	**Crude**
	✗	✓
Termination criteria	The primary well is contained and killed to prevent any further release of hydrocarbon to the environment	

Santos identified the worst-case credible oil spill scenario for assessment as:

- a subsea LOWC with the release of 8,474 STB (1,350 m^3) of Mutineer-Exeter light crude oil (approximately 75 m^3/day or 471 bbl/day) over 126 days.

9.2.1 Subsea first response toolkit (SFRT)

If a subsea LOWC was to occur, the site would require a detailed assessment to determine the most suitable intervention methods for the incident. This may be achieved through the use of remotely operated vehicles (ROVs) (supplied by Santos via existing contractual arrangements) and the AMOSC Subsea First Response Toolkit (SFRT). The SFRT includes debris clearance equipment and ancillary tools.

In the event of a loss of well control incident, Santos will mobilise the AMSOC SFRT from Fremantle to Dampier for transhipment to a suitable vessel for transport to, and deployment at the incident location. The SFRT is located at Oceaneering's facilities at Jandakot. If required, the equipment would be mobilised via road from Jandakot to Dampier. It is estimated this would take 10 hours to arrange and up to 7 days to load and transport to Dampier, depending on the destination and time of year. A suitable vessel would be acquired by Santos during this timeframe and arrive in Dampier (within 9 days of the call-out). Once the equipment is loaded, the vessel will mobilise to site and be ready to commence operations by day 11–12 from call-out. Specialist personnel to deploy the SFRT will be provided via Santos' contract with Oceaneering and will be available in Dampier within 72 hours (3 days). Vessel specifications are outlined in the Santos Offshore Source Control Planning and Response Guideline (DR-00-ZF-20001).

9.2.2 Relief Well Drilling

Relief well drilling is the primary source control strategy to control a LOWC during cessation of production activities.

The Santos 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.

9.2.2.1 Relief well planning

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

+ SPE 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.
+ United Kingdom Oil and Gas Relief Well Guidelines, Issue 2, 2013: This methodology is used to confirm a well complexity analysis.

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

+ rig name
+ rig contract status (Operator and contract duration)
+ current location
+ maximum water depth capability
+ rig type (floating vs jack-up; mooring type; Rig Design/Class)
+ available drilling envelope
+ blowout preventer specifications
+ blowout preventer (BOP) /lower marine riser package (LMRP) connector specifications
+ mud pumps specifications/capability
+ choke and kill line internal diameters
+ storage capability (i.e. MDO, base-oil, brine, drill-water, potable water, bulks)
+ NOPSEMA safety case (yes/no).

In order to facilitate and expedite the use of regional MODU for relief well drilling an Australian Petroleum Production & 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 would be submitted within 14 days from the well leak, however the critical path time allowed for the actual writing 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.

9.2.2.2 Relief well schedule

An indicative relief well drilling schedule is provided in **Table 9-4**. This is based on control of the well by 18 weeks (126 days). This period is based on the worst-case time taken to identify a well leak for the unmanned facility (7 weeks or 49 days), plus indicative mobilisation durations, relief well planning and operations (11 weeks or 77 days); a total of 18 weeks (126 days). It could take up to 33 days to have a MODU on site ready to spud, from time of notification.

Long lead item equipment to enable a relief well to be drilled within this timeframe is 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 APPEA Drilling Industry Steering Committee Source Control Response Industry (SCRI) Working Group. The SCRI working group is an APPEA Drilling Industry Steering Committee initiative which has been 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.

Table 9-4: Schedule for mobile offshore drilling unit arriving on site (from time of notification)

LOWC relief well		
Task	**Duration (days)**	**Controls**
Event reported. Begin sourcing of rig for relief well drilling operations. Concurrently, stand up relief well drilling team and activate relief well specialists.	2	+ On-site communications + Active IMT, including Operations Section Chief, Source Control Branch Director and Relief Well Team Lead + Stood-up Relief Well Team (as per Santos Offshore Source Control Emergency Response Plan) + Relief Well Drilling specialist services contract (Wild Well Control) + Regional MODU tracking + 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 and submit to NOPSEMA. Concurrently, prepare relief well design and dynamic kill plan. Prepare relief well WOMP and submit to NOPSEMA.	7	+ Active IMT + Santos Offshore Source Control Emergency Response Plan (DR-00-OZ-20001) + Pre-completed campaign specific Source Control Plan complete with relief well study + Relief Well Drilling specialist services contract (Wild Well Control) + Regional MODU tracking + APPEA MoU: Mutual Assistance + Pre-verified access to relief well long lead equipment (e.g. casing and wellhead)

LOWC relief well		
Task	**Duration (days)**	**Controls**
		+ Drilling services contracted.
Contract relief well MODU. Concurrently, continue preparations for rig mobilisation. Concurrently, NOPSEMA assessment of relief well MODU SCR and relief well WOMP. Mobilise relief well MODU to location.	24	+ Active IMT + Santos Offshore Source Control Emergency Response Plan (DR-00-OZ-20001) + Relief Well Drilling specialist services contract (Wild Well Control)
Total days before arrival, ready to spud/commence relief well operations	33	
Drill and construct relief well and execute dynamic well kill operations	44	+ Active IMT + Santos Offshore Source Control Emergency Response Plan (DR-00-OZ-20001) + Relief Well Drilling specialist services contract (Wild Well Control)
Total days from notification of LOWC to well kill	**77**	

9.3 Source control implementation guidance

Relief well drilling is the primary source control strategy to control a subsea LOWC during MEFF Cessation of Production 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 source control methods.

A high-level summary of 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 Team 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-planning work described in **Section 9.2.2.1**, and have prepared in time to procure equipment and personnel before MODU arrival on location.	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 spud and drill.	Relief Well Team Leader	❑
	SFRT		
	Activate Subsea First Response Toolkit (SFRT) equipment. Activate Oceaneering personnel for deployment	Designated call-out authority (Incident Commander) Source Control Branch Director	❑
	Contract suitable vessel capable of deploying SFRT equipment	Logistics Section Chief Source Control Branch Director	❑
	Arrange road transport of SFRT equipment from Jandakot to Dampier.	Logistics Section Chief Source Control Branch Director	❑

Action		Responsibility	Complete
	Arrange equipment to be loaded on to vessel once in Dampier and authorise transit to field.	Logistics Section Chief Operations Section Chief Source Control Branch Director	❑
	Conduct initial ROV survey at the release point to determine the nature of the release, behaviour of the oil, and estimate the oil and gas flow rates.	Operations Section Chief Source Control Branch Director	❑
Ongoing actions	**Relief well**		
	Design relief well, using relief well pre-planning work, as applicable, and have prepared in time to procure equipment and personnel before MODU arrival on location.	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 spud and drill.	Relief Well Team Leader	❑
	Monitor progress of relief well drilling and communicate to IMT.	Relief Well Team Leader	❑

9.4 Environmental performance

Table 9-6 indicates the environmental performance outcomes, controls and performance standards for the Source Control 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/onshore environment.		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Response Preparedness			
Source control – relief well drilling	Santos Source Control Planning and Response Guideline (DR-00-OZ-20001)	The Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) is in place and up-to-date during the activity	Santos Source Control Planning and Response Guideline (DR-00-OZ-20001)
	Relief Well MODU Capability Register	A Relief Well MODU Capability Register is maintained during the activity through monthly monitoring	Relief Well MODU Capability Register
	Contract and Equipment Access Agreement with WWC	Contract and Equipment Access Agreement with WWC are maintained providing technical support and equipment	Contract with WWC
	Relief well drilling supplies readily available in Western Australia	Long lead equipment for a relief well drilling will be readily available to Santos	Audit records
	Arrangements for source control emergency response personnel	Arrangements for access to source control personnel are maintained during the activity	Contract/ Memorandums of Understanding for source control personnel
Source control – SFRT	Arrangements to enable access to SFRT equipment and personnel	Maintenance of access to SFRT equipment and personnel	AMOSC SFRT participating member OTA Agreement with Oceaneering
	Arrangements in place to monitor availability of vessels capable of transporting SFRT	Vessel availability shall be monitored regularly via Santos' contracted vessel broker	Shipbroker reports
	Maintenance of MSAs with multiple vessel providers	Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
Source control – vessel collision	Vessel Spill Response Plan (SOPEP/SMPEP)	Support vessels have a SOPEP or shipboard marine pollution emergency plan (SMPEP) that	Audit records Inspection records

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine/onshore environment.		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Response Preparedness			
		outlines steps taken to combat spills	
		Spill exercises on support vessels are conducted as per the vessels SOPEP or SMPEP	Spill exercise close out reports
Response Implementation			
Source control – relief well drilling	Source Control Branch	Source Control Branch mobilised within 24 hours of being notified of well leak incident	Incident log
	Equipment/Services for Relief Well drilling	Equipment/Services for Relief Well drilling sourced within five days of being notified of well leak incident	Incident log
	Well Control Specialists	Well control specialists mobilised within 72 hours of being notified of well leak incident	Incident log
	Relief Well MODU	MODU for relief well drilling to be on site by Day 33 of being notified of well leak incident	Incident log
	Relief Well	Relief well completed within 77 days of being notified of well leak incident	Incident log
	Source Control Planning and Response Guideline (DR-00-OZ-20001)	Relief well drilling implemented in accordance with the Source Control Planning and Response Guideline (DR-00-OZ-20001) during a well release	Incident log
Source control – SFRT	Access to suitable SFRT vessel	Vessel mobilised to Dampier within 9 days of IMT call-out	Incident Log
	Access to personnel for the deployment of the SFRT	Oceaneering to mobilise personnel to Dampier within 9 days of IMT call-out	Incident Log
Source control – vessel collision	As per the vessel SOPEP	Actions to control spill associated with a vessel incident followed in accordance with SOPEP	Vessel logs

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
+ initial oil characterisation
+ operational water quality monitoring
+ shoreline clean-up assessment.

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 tactics 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**	**Crude**
	✓	✓
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 10-39 lists the environmental performance standards and measurement criteria for 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.		Logistics Section Chief	❑
	Record surface slick location and extent, weather conditions, and marine fauna. Complete vessel surveillance forms (**Appendix E:** Vessel surveillance observer log) 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	❑
	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.	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

<table>
<tr><th colspan="2">Task</th><th>Time from IMT call-out</th></tr>
<tr><td colspan="2">IMT begins sourcing Santos-contracted vessel or VOO for on-water surveillance</td><td><90 minutes</td></tr>
<tr><td colspan="2">VOO on site for surveillance</td><td><24 hours (daylight dependent)</td></tr>
<tr><th colspan="3">Minimum resource requirements</th></tr>
<tr><td colspan="3">One vessel. No specific vessel or crew requirements.</td></tr>
<tr><th colspan="3">Approximate steam time</th></tr>
<tr><td>Deployment location</td><td>Approximate distance to operational area[9] (nautical miles)</td><td>Approximate steam time[10] (hours)</td></tr>
<tr><td>Dampier</td><td>78</td><td>7.5</td></tr>
<tr><td>Exmouth</td><td>210</td><td>21</td></tr>
</table>

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

<table>
<tr><th>Environmental performance outcome</th><td colspan="2">Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision -making</td></tr>
<tr><th>Initiation criteria</th><td colspan="2">Notification of a Level 2/3 spill</td></tr>
<tr><th rowspan="2">Applicable hydrocarbons</th><th>MDO</th><th>Crude</th></tr>
<tr><td>✓</td><td>✓</td></tr>
<tr><th>Termination criteria</th><td colspan="2">+ 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</td></tr>
</table>

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.

[9] As measured to geometric centre point of operational area

[10] At average rate of 10 knots

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. 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 10-39 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 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	❑

Action		Consideration	Responsibility	Complete
	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 ops. 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**: Aerial surveillance observer log) and Aerial Surveillance Surface Slick Monitoring Template. Calculate volume of oil (**Appendix G**: Aerial surveillance surface slick monitoring template). Take still and/or video images of the slick.	Thickness estimates are to be based on the Bonn Agreement Oil Appearance Code.	Aerial Observer	❑
	Record presence and type of fauna by completing the Aerial Surveillance Marine Fauna Sighting Record Sheet (**Appendix H**: Aerial surveillance marine fauna sighting record).		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	❑

Action		Consideration	Responsibility	Complete
Ongoing actions	Update flight schedule for ongoing aerial surveillance as part of broader Aviation Subplan of 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 & flight Crew	Santos contracted provider/s (primary provider currently Babcock)	Two contracted (one primary + one backup) + additional as required	Karratha Learmonth Onslow	Wheels up within 1 hour for Emergency Response. Spill surveillance <10 hours (daylight dependent)
Aerial Surveillance Crew	Santos aerial observers AMOSC Industry Mutual aid	Seven Santos staff Nine AMOSC staff Five AMOSC Core Group personnel available 54 additional trained industry mutual aid personnel	Perth and Varanus Island (VI) (Santos aerial observers) Australia wide	Santos trained personnel – next day mobilisation to airbase <24 hours
Drones and pilots ** secondary response to assist vessel-based surveillance	AMOSC OSRL – Third-Party UAV provider Local WA hire companies	Two pilots Two qualified remote pilots, however response is on best endeavour 10+	Geelong Perth Perth and regional WA	<48 hours OSRL – depending on the port of departure, one to two days if within Australia

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

<table>
<tr><th colspan="2">Task</th><th>Time from IMT call-out</th></tr>
<tr><td colspan="2">Aircraft activated for aerial surveillance</td><td><3 hours</td></tr>
<tr><td colspan="2">Aircraft on site for aerial surveillance</td><td><6 hours (daylight dependent)</td></tr>
<tr><td colspan="2">Trained Aerial Observers mobilised to airbase (Dampier)</td><td><24 hours (daylight dependent)</td></tr>
<tr><td colspan="3">Minimum resource requirements</td></tr>
<tr><td colspan="3">+ Santos contracted helicopter and pilots (based in Dampier)
+ Santos trained Aerial Observers</td></tr>
<tr><td colspan="3">Approximate flight time</td></tr>
<tr><td>Airport</td><td>Approximate distance[11] (nm)</td><td>Approximate flight time[12] (hours: minutes)</td></tr>
<tr><td>Dampier</td><td>78</td><td>0:40</td></tr>
<tr><td>Exmouth (Learmonth)</td><td>225</td><td>1:50</td></tr>
</table>

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

<table>
<tr><th>Environmental performance outcome</th><td colspan="2">Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making</td></tr>
<tr><th>Initiation criteria</th><td colspan="2">Notification of a Level 2 or 3 spill
May be deployed for a Level 1 spill if deemed beneficial by the OSC</td></tr>
<tr><th rowspan="2">Applicable hydrocarbons</th><td>MDO</td><td>Crude</td></tr>
<tr><td>✓</td><td>✓</td></tr>
<tr><th>Termination criteria</th><td colspan="2">+ 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</td></tr>
</table>

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. 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 10-39** lists the environmental performance standards and measurement criteria for this strategy.

[11] As measured to geometric centre point of operational area

[12] At average flight speed of 120 knots

Table 10-10: Implementation guidance – tracking buoys

Action		Consideration	Responsibility	Complete
Initial actions	Organise vessel to mobilise 2 x tracking buoys to site from Dampier.	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 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	☐
	Use tracking buoy data to maintain Common Operating Picture.	Data tracked online.	Planning Section Chief / GIS	☐
	Relay information to spill fate modelling supplier for calibration of trajectory modelling.		Planning Section Chief / GIS	☐
Ongoing actions	Assess the need for additional tracking buoys in the spill scenario and identify/nominate preferred deployment locations.	Incident Action Plan 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 Tracker Buoys located on the North West Shelf) or from AMOSC stockpiles.		Logistics Section Chief	☐
	Direct the deployment of the Tracker Buoys – for continuous releases over multiple days use a rolling deployment/collection of buoys to provide better coverage of plume direction.		Operations Section Chief	☐
	Deploy tracking buoys.		Vessel Master	☐

Action		Consideration	Responsibility	Complete
	Monitor movement of tracking buoys.		Planning Section Chief /GIS	❑
	Relay information to spill trajectory modelling supplier for calibration of trajectory modelling.		Planning Section Chief /GIS	❑

Table 10-11: Tracking buoy resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Tracking buoys	Santos	2	Dampier	Dampier – 8 hours to site pending vessel availability
		8	VI, Dampier	VI/Dampier buoys – 48–72 hours to site pending vessel availability
AMOSC tracking buoys	AMOSC	2	Broome	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 (see **Table 10-12**)
		6	Fremantle	
		4	Geelong	

Table 10-12: Australian Marine Oil Spill Centre equipment mobilisation timeframes

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

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

Task	Time from IMT call-out
Tracking buoys deployed from Dampier	<8 hours to site pending vessel availability
OR	
Tracking buoys deployed from Dampier/VI	48-72 hours to site 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**	**Crude**
	✓	✓
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 'Standard Practice for Development and Use of Oil Spill 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 day-time 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. 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 10-39 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 Procedure Index). 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 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, tracker buoys) to be given to modelling provider to verify and adjust fate predictions of the spill and improve predictive accuracy.		Planning Section Chief /GIS	❑
	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	❑
	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	❑
	Identify location and sensitivities at risk based on the trajectory modelling and inform IMT. Conduct operational NEBA on proposed response strategies.		Environment Unit Leader	❑

Action		Consideration	Responsibility	Complete
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	❑
	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	❑

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 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 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**	**Crude**
	✓	✓
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 done 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.

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 10-39 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 (Santos Duty Managers/Incident Commanders) is required.	Planning Section Chief	❑
	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 surveillance information to validate spill fate and trajectory.		Planning Section Chief	❑
	Use monitor and evaluate data 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	AMOSC: one hour if satellite images available OSRL: Within 4 hours of satellite image acquisition (i.e. latest pass with no cloud)

10.6 Initial oil characterisation

Table 10-21 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-21: Initial oil characterisation – 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	Crude
	✓	✓
Termination criteria	+ Oil sample and analysis to terminate once enough data has been collected to profile the oil characteristics throughout weathering and to provide oil for toxicity testing, OR + As directed by the relevant control agency	

10.6.1 Overview

Given MDO is a common fuel type with known properties and Mutineer-Exeter light crude is a hydrocarbon that has been previously assayed, the general physical and chemical characteristics of these hydrocarbons are known and have been presented in **Appendix A: Hydrocarbon characteristics and behaviour**. Nevertheless, sampling and analysis of the released hydrocarbon will provide the most accurate information on the hydrocarbon properties at the time of release.

The composition and physical properties of the hydrocarbon will also evolve over time through weathering processes that change its composition and properties, such as the viscosity, density, water content and pour point. The rate of change of the hydrocarbon properties will affect the likely time-window of opportunities for particular responses and the associated logistical requirements of these responses.

10.6.2 Implementation guidance

Table 10-22 provides guidance to the IMT on the actions and responsibilities for this strategy. **Table 10-23** provides a list of resources that may be used to implement this tactic. 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 10-39 lists the environmental performance standards and measurement criteria for this strategy.

10.6.3 Oil sampling and analysis

Laboratory analysis

Using on-site VOOs, oil samples are to be taken daily where possible from fresh oil, and from the weathered oil locations, nominally representing 24 hours old, 48 hours old and 72 hours old (as they occur) and dispatched to the laboratory for analysis.

Laboratory analysis of the chemical and physical properties of the recovered oil, including gas chromatography/mass spectrometry for the purpose of fingerprinting the oil constituents, is to be undertaken. Fingerprinting of the released hydrocarbon potentially allows contamination to be traced back to the source where this is otherwise unclear or in dispute.

Ecotoxicology assessment of the oil is to be conducted at an ecotoxicology laboratory following the revised Australian and New Zealand Water Quality Guidelines. The quantity of oil required for analysis will be confirmed by the laboratory but is expected to be in the order of 6 to 10 L of oil. Testing results will provide the concentrations at which toxicity endpoints consistent with revised Australian and New Zealand Water Quality Guidelines are met for each test. Overall species protection concentrations, including 90%, 95% and 99% species protection trigger levels are then to be generated using a species sensitivity distribution fitted to the data (e.g. by using the Burrlioz software program).

Table 10-22: Implementation guidance – initial oil characterisation

Action		Consideration	Responsibility	Complete
Initial actions	Source available vessels (on hire or VOO) for oil sampling.	Can be multi-tasked – e.g. for vessel surveillance or tracking buoy deployment.	Operations Section Chief Logistics Section Chief	❑
	Source sampling equipment. Confirm sampling methodology. Confirm laboratory for sample analysis. Develop health and safety requirements/controls.	Refer **Table 10-23** for resource availability. Appendix A and D of CSIRO oil spill monitoring handbook provide suitable procedure.	Environment Unit Leader Safety Officer	❑
	Vessel directed to sampling location.	Sampling of oil at thickest part of slick – typically leading edge.	Operations Section Chief	❑
	Vessel crew to undertake sampling and delivery of samples to Dampier for dispatch to laboratory. Environment Unit Leader to confirm analysis of oil with lab.	Logistics personnel to assist with logistics of sending oil samples to laboratory for analysis.	Operations Section Chief Environment Unit Leader Logistics Section Chief	❑
Ongoing actions	Continue sample collection post release where oil is available.	Initial monitoring by crew of available vessels – Once mobilised to site Santos scientific monitoring provider to continue sampling of oil in conjunction with operational water quality monitoring.	Operations Section Chief Environment Unit Leader Logistics Section Chief	❑

Table 10-23: Initial oil characterisation – resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Oil sampling kits	Santos/AMOSC	3	Dampier, Exmouth, Varanus Island	Within 48 hours
Bulk oil sampling bottles	Intertek/Santos	As required	Perth	Within 48 hours
Santos Contracted Vessel Providers Vessels of Opportunity identified through AIS vessel tracking system	Availability dependent upon Santos and Vessel Contractor activities.	Availability dependent upon Santos and Vessel Contractor activities. Locations verified through AIS vessel tracking system	Pending availability and location. Expected within 24 hours	Santos contracted vessel providers Vessels of Opportunity identified through AIS Vessel Tracking
National Association of Testing Authorities (NATA) accredited laboratory/ personnel for analysis	Intertek	NA	Perth	24+ hours

Table 10-24: Initial oil characterisation – first-strike response timeline

Task	Time from IMT call-out
Oil sample collection	<48 hours (daylight dependent)
Oil samples arrive at lab for analysis	<5 days
Minimum resource requirements	
+ One vessel; no special requirements; oil sampling can be done concurrently with other tasks + One oil sampling kit + Sampling jars for bulk oil collection	

10.7 Operational water quality monitoring

10.7.1 Operational water sampling and analysis

Table 10-25 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-25: Operational water quality sampling and analysis – 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	Crude
	✓	✓
Termination criteria	+ Operational water sampling and analysis will continue for 24 hours following control of the source provided oil is no longer detectable, OR + As directed by the relevant Control Agency, OR + Vessel surveillance will terminate if there are unacceptable safety risks associated with volatile hydrocarbons at the sea surface.	

Operational sampling of oil and oil in water will be undertaken at discrete locations, providing visual observations, real-time fluorometry/ dissolved oxygen readings and providing oil and water samples for laboratory analysis. The intent of this sampling is to confirm the distribution and concentration of oil, validating spill trajectory modelling and providing and informing the selection and implementation of other response strategies, including scientific monitoring.

Table 10-26 presents the water quality sampling and analysis plan considerations.

This monitoring is complementary to scientific water quality monitoring (SMP1) delivered through the Oil Spill SMP in terms of methodology and required skillset and can be provided through Santos' Scientific Monitoring Provider (**Section 16**).

10.7.2 Implementation guidance

See **Table 10-27** for the operational water quality sampling and analysis implementation guide. 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 10-39** lists the environmental performance standards and measurement criteria for this strategy.

Table 10-26: Operational water quality sampling and analysis plan considerations

Considerations for operational water quality sampling and analysis	
Scope of work	The work scope for operational water quality monitoring will be driven by the IMT, confirming objectives for each operational period.
Survey design	The operational water sampling activities will be conducted by experienced environmental scientists and managed through the IMT Incident Action Planning process. The exact nature of the sampling activities will depend upon the objectives for each operational period; however, the sampling design and methodology will consider the following points: + Sampling locations will be moved with the slick and/or plume based on the observed or predicted location and movement of oil on water and subsea plumes. This will be informed by vessel/aerial surveillance, satellite tracking buoys and spill fate modelling. + At each discrete location, sampling will initially be conducted using a conductivity-temperature-depth (CTD) meter along a depth profile which captures the three-dimensional distribution of the oil. The CTD would require fluorometry and dissolved oxygen sensors as part of the sensor package to record the presence of oil (fluorometry) and the activity of hydrocarbon degrading bacteria (dissolved oxygen). Fluorometers appropriate to the hydrocarbon type will need to be selected. + The CTD would help inform the depth at which water samples would be taken. + For a subsea release or where surface oil is present in shallow water (<5 m) sampling should involve a depth profile from the seabed to surface waters. Profiles should ensure that the full gradient of oil in water concentration can be determined. + Oil and oil in water samples are to be collected using suitable pumping or sampling apparatus. For samples at depth a Niskin bottle(s) or similar device that allows remote closing and discrete sampling at depth is to be used. Alternatively, water samples can be pumped from defined depths using a hose suspended vertically using a suitable pump for water sampling (e.g. a peristaltic pump). + Samples are to be collected in clean, fully labelled glass jars, filled to the top and refrigerated/ kept cool and in darkness during storage and transport. Handling, storage and documentation requirements to be confirmed with laboratory but holding time <7 days is expected requirement. + Oil and oil in water samples will be replicated at each site to allow intra-site variability to be assessed and appropriate quality assurance and control samples incorporated into replicates. + Santos will coordinate transportation of samples from the sampling location to the laboratory. Samples will be accompanied with a completed Chain of Custody form. + Water samples also to be provided to an independent National Association of Testing Authorities-accredited laboratory in Perth for hydrocarbon suite analysis including polycyclic aromatic hydrocarbons.

Considerations for operational water quality sampling and analysis	
Analysis and reporting	+ All data collected on oil properties provided in spreadsheets (including GPS location, depth of sampling, timing, on-water observations, in-situ readings and water sample label details) to IMT on an ongoing basis during spill response operations. + Daily field reports of results provided to the IMT. + Analytical analysis of oil properties following laboratory evaluation. + Final report detailing all data collected on oil properties throughout the monitoring program including relevant interpretation.

Table 10-27: Implementation guidance – operational water quality sampling and analysis

Action		Consideration	Responsibility	Complete
Initial actions	Activate Santos Monitoring Service Provider for Operational Water Quality Monitoring.		Environment Unit Leader	❑
	Obtain spill trajectory modelling and provide to Monitoring Service Provider.		Environment Unit Leader Planning Section Chief GIS Support	❑
	Develop Monitoring Action Plan (Including Sampling and Analysis Plan) for operational water quality monitoring. Plan to also consider oil characterisation sampling (**Section 10.6**)– Monitoring Service Provider to take over this sampling once mobilised.	Sites to be selected using oil spill trajectory modelling and distribution of oil from surveillance tactics. Refer **Table 10-26** for considerations for Sampling and Analysis Plan.	Monitoring Service Provider Environment Unit Leader	❑
	Develop health and safety plan including potential exposure to volatile gases/VOCs.	Refer Santos Oil Spill Response HSE Management Manual (SO-91-RF-10016).	Monitoring Service Provider Safety Officer	❑

Action		Consideration	Responsibility	Complete
	Monitoring Service Provider to assemble team/s and water quality monitoring equipment.		Monitoring Service Provider	❑
	Organise vessels, accommodation and transport requirements to mobilise monitoring team/s to site.	Monitoring Service provider to outline requirements in resource request form.	Logistics Section Chief	❑
	Sampling and analysis undertaken. Daily communication and confirmation of sampling plan with OSC and IMT. Daily activity/data reports provided to IMT. Oil/water samples dispatched to nominated laboratories for analysis.		Monitoring Service Provider On-Scene Commander Operations Section Chief Environment Unit Leader Logistics Section Chief	❑
Ongoing actions	Monitoring results to be conveyed to IMT through Common Operating Picture and provided to spill trajectory modeller to validate predictions.		Planning Section Chief GIS Support Environment Unit Leader	❑

Table 10-28: Operational water quality sampling and analysis – resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Water quality monitoring personnel	Monitoring Service Provider (currently Astron/BMT)	Approx. 6 (based on capability reports)	Perth-based	Personnel and equipment within 72 hours from approval of work scope – pending vessel availability
Water quality sampling equipment and water quality meters	Third-party suppliers via Monitoring Service Provider (currently Astron/BMT)	Multiple providers	Australia based	
Contracted water quality monitoring vessels	Santos Contracted Vessel Providers	Availability dependent upon Santos and Vessel Contractor activities; suitable vessels identified through AIS Vessel Tracking	Locations verified through AIS Vessel Tracking Software	<72 hours

Table 10-29: Operational water quality sampling and analysis – first-strike response timeline

Task	Time from IMT call-out
IMT activates monitoring service provider.	<4 hours
Operational water quality monitoring personnel, equipment and vessel deployed to spill site.	<72 hours
Minimum resource requirements	
+ Water quality monitoring vessel/s – refer Santos Offshore ER Intranet for vessel specification. + Water quality monitoring team (through monitoring service provider). + Water quality monitoring equipment (through monitoring service provider).	

10.7.3 Continuous fluorometry surveys

Table 10-30 provides the environmental performance outcome, initiation criteria, termination criteria and other key aspects for this strategy.

Table 10-30: Continuous fluorometry surveys – 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	Level 2/3 spill	
Applicable hydrocarbons	**MDO**	**Crude**
	✓	✓
Termination criteria	+ Continuous fluorometry surveys will continue for 24 hours following control of the source provided oil is no longer detectable, OR + As directed by the relevant Control Agency.	

In addition to operational water sampling and sensor deployment at discrete locations, a continuous fluorometry survey(s) may be run across the expected slick/plume extent, as well as vertically through the water column. This allows a far greater area of coverage than discrete sampling, aiding in the mapping of entrained and dissolved oil movement.

Subsurface gliders containing fluorometers built into the body of the glider may be used for this monitoring and would be preferential for monitoring a continuous subsea release (subsea LOWC from all locations). This will allow continuous monitoring of entrained oil covering a large area and will provide near real-time three-dimensional data on the distribution of entrained oil to enable decision-making within the IMT. Similarly, other sources of monitoring data (e.g. spill fate modelling) can be used in near real-time to inform the path of the subsurface glider. Subsurface gliders are particularly suited to subsea releases where oil may be distributed below surface layers.

Fluorometers towed behind vessels will be used as an alternative or complementary approach for a subsea release and would be preferred for surface spills and to monitor oil distribution through the water column.

10.7.4 Implementation guidance

Table 10-31 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 10-32** provides a summary of resources that may be used to implement this strategy. **Table 10-33** details the minimum first-strike requirements to be mobilised on activation. 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 10-39 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-31: Continuous fluorometry surveys – implementation guidance

Action		Consideration	Responsibility	Complete
Initial actions	Activate Monitoring Service Provider and engage to provide fluorometry services (personnel and equipment) as part of Operational Water Sampling and Analysis – refer **Table 10-27** for actions.		Monitoring Service Provider Environment Unit Leader	❑
	Activate OSRL monitoring and determine availability of subsea gliders and towed fluorometry equipment.	OSRL can provide specialist technical advice on operation of towed fluorometers. Consider: Engaging OSRL for review and input into monitoring action plan for towed fluorometry.	Incident Commander Environment Unit Leader	❑
	Determine suitability of subsea gliders for monitoring.	Subsurface gliders containing fluorometers built into the body of the glider may be used for this monitoring and would be preferential for monitoring a continuous subsea release (well leak scenario).	Environment Unit Leader	❑
	If gliders and pilot/s available and suitable for incident, engage provider to develop Monitoring Action Plan.	Arrange joint meeting with spill modelling provider and OSRL/glider operator to develop monitoring design and ongoing data transfer protocols to meet objective of model validation.	Environment Unit Leader	❑
	Source vessels and other logistics to support monitoring.		Logistics Section Chief Operations Section Chief	❑
	Conduct monitoring as per monitoring action plan with deployment area guided by other operational monitoring studies.	The scope of monitoring will be dictated by the response strategies being employed. Appendix F of CSIRO oil spill monitoring handbook (CSIRO, 2016) provide standard operating procedures using fluorometry equipment.	Operations Section Chief Planning Section Chief Environment Unit Leader	❑
On	Provide daily data reports and spatial outputs IMT.		Monitoring Provider	❑

Action		Consideration	Responsibility	Complete
	Monitoring results to be incorporated into Common Operating Picture.		Planning Section Chief GIS Support	❑

Table 10-32: Continuous fluorometry surveys – resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Towed fluorometers	OSRL	Towed Fluorometers: 7 Turner C3 fluorometers globally	4 in Southampton, 2 in Singapore and 1 in Fort Lauderdale	<72 hours
Glider mounted fluorometers	OSRL	Subsea glider: Qty. subject to availability from OSRL contractor – one engineer from OSRL contractor to deploy and operate the Glider	Gliders based in Australia (Perth, Sydney, Brisbane) OSRL towed fluorometers out of Singapore, Southampton and Fort Lauderdale	<72 hours dependent upon availability
Vertical particle size analyser – Sequoia LISST 100x	Monitoring Service Provider (currently Astron/BMT)	1	Perth	<72 hours
Water quality monitoring personnel to operate towed fluorometers	Monitoring Service Provider (currently Astron/BMT)	Approx. 6 (based on capability reports)	Perth-based	<72 hours
Glider (remote) pilot/s and deployment crew	Third-party provider via OSRL	Subsea glider: Qty. subject to availability from OSRL contractor – one engineer from OSRL contractor to deploy and operate the glider	Perth-based pilot and deployment crew	<72 hours dependent upon availability

Table 10-33: Operational water quality sampling and analysis – first-strike response timeline

Task	Time from IMT call-out
IMT activates OSRL and Monitoring Service Provider.	<4 hours
Monitoring Service Provider water quality monitoring personnel deployed to site.	<72 hours
Towed fluorometers deployed to site.	<72 hours
Glider and pilot/s and deployment crew deployed (if gliders available and appropriate).	<72 hours (if gliders available and appropriate)
Minimum resource requirements	
+ Water quality monitoring vessel/s – refer Santos Offshore ER Intranet for vessel specification. + Water quality monitoring team (through monitoring service provider). + OSRL towed fluorometer (Turner C3) + Particle size analyser.	

10.8 Shoreline clean-up assessment

Table 10-34 provides the Environmental Performance Outcome, initiation criteria, termination criteria and other key aspects for this strategy.

Table 10-34: Shoreline clean-up assessment – 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	Level 2 or 3 spills – may be deployed in a Level 1 incident (to be determined by OSC)	
Applicable hydrocarbons	**MDO**	**Crude**
	✓	✓
Termination criteria	As directed by the relevant Control Agency	

To assist in determining which response methods are most appropriate for shorelines, it is necessary to obtain information about shoreline character (topography, complexity, exposure, etc.), degree and distribution of oiling (if present), presence of sensitive receptors (habitats, fauna, etc.) and information on shoreline processes and access routes that could aid or hamper response efforts. This detailed information can be collected from shoreline clean-up assessments. A well-established systematic approach known as Shoreline Clean-up Assessment Technique (SCAT) will be used to document the status of oiled shorelines in the event of a worst-case release and their subsequent treatment recommendations.

DoT are the designated Control Agency for shoreline response in WA. The designated Control Agency will direct resources provided through Santos for the purposes of shoreline clean-up assessments and shoreline response activities. Santos will provide additional information on shoreline character and oiling collected as part of aerial surveillance activities carried out under its control (refer **Table 4-2**).

Existing information on shoreline character, distribution of habitats/fauna and access/safety constraints can be obtained from:

+ Santos Energy GIS, including habitat/fauna distribution layers and aerial imagery
+ Oil Spill Response Atlas Web Map Application
+ Pilbara Region Oiled Wildlife Response Plan (DBCA & AMOSC, 2014)
+ WA Marine Oil Pollution Risk Assessment Web Map Application (rankings and general information on protection priorities)

10.8.1 Implementation guidance

The information provided below is included for planning purposes and represents how Santos would approach shoreline clean-up assessments to support the Control Agency. In the event of a spill with the potential for shoreline contact, the Control Agency is responsible for the implementation of the response and therefore, depending on the circumstances of the spill, may determine that some tasks be varied, should not be undertaken or should be reassigned.

Table 10-35 presents considerations for planning and conducting the assessments. The implementation guide for Shoreline Clean-up and Assessment is found in **Table 10-36**. **Table 10-37** provides a list of resources that may be used to implement this strategy and **Table 10-38** details the minimum first-strike mobilisation requirements for Santos on activation. **Table 10-39** lists the Environmental Performance Standards and Measurement Criteria for this strategy.

Table 10-35*: Shoreline clean-up assessment considerations*

Considerations for Shoreline Clean-up Assessment	
Survey design	Shoreline Clean-up Assessment requires a systematic assessment of shorelines, which is typically undertaken in a number of stages (according to the extent of the spill): + Reconnaissance surveys: designed as an initial phase (or further as required, such as inaccessible shorelines) to characterise the distribution, extent, and condition of shoreline habitats + Continual monitoring surveys: monitors hydrocarbon spill extent at the shoreline to assess the potential impact, extent of actual impact, and the effectiveness of clean-up. A shoreline clean-up assessment may include the following tasks: + Assessment of shoreline character, habitats and fauna, including: – shoreline structured biotic habitats – distribution of fauna – shoreline and processes (e.g. wave, tidal flows) – shoreline substrate (e.g. mud, sand, pebble, rock) – shoreline form (e.g. width, shape and gradient) – access/safety constraints. + Assessment of shoreline oiling (if present): – surface distribution and cover – subsurface distribution – oil type, thickness, concentration and physical character – sampling of oil for laboratory analysis.

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Considerations for Shoreline Clean-up Assessment	
	+ Recommendations for response: – applicable strategies based on oil type and habitat – potential access, safety and environmental constraints – likely resourcing (personnel and equipment) requirements. + Post-treatment shoreline survey and sign-off/completion, including: – post-clean-up inspections to confirm if end points have been achieved or if they require further treatment – approve termination of response activities in each sector. Surveys undertaken on foot, by vehicles or by small vessel will occur at prioritised areas (access permitting) to provide a close-range assessment of shoreline physical characteristics, coastal habitats/fauna, scale and character of oiling and safety/access constraints. Shoreline clean-up assessment team leaders will include personnel from AMOSC Core Group, State and National Response Team and OSRL, or contracted staff who have completed SCAT training. Team members may include personnel who have completed a brief training course and are supervised on the job by team leaders, particularly for deployment to locations that are not contacted in the first few weeks of the spill. The deployment of survey teams will be directed by the relevant control agency. The deployments will be informed by the observed and predicted contact of oil and from existing baseline information on shoreline character. Shoreline surveys will be undertaken within segments that are recorded and/or mapped that share common traits based on coast geomorphology, habitat type, fauna presence, level of oiling or access. Information on shoreline character and habitat/fauna distribution for each segment should be recorded through the use of: + still or video imagery collected with simultaneous GPS acquisition + field notes together with simultaneous GPS acquisition + mud maps outlining key natural features, oil distribution, imagery locations of quantitative data (transects, oil samples) + transects (cross-shore, longshore) and vertical sediment profiles + samples of oil and/or oiled sediments. The parameters that should be assessed are: + physical characteristics: rocky, sandy beach, flat, dune, wetland, other + major habitat types: mangrove, salt marsh, saltpan flats, fringing reef, rubble shore, seagrass verge + coastal fauna and key habitats (e.g. nests) including quantification/distribution of oiled fauna + state of erosion and deposition: deposition, erosion, stable + human modified coastline (access tracks, facilities, etc.) + oil character, if present, including appearance, surface thickness, depth (into sediments), distribution, area and percentage cover.
Analysis and reporting	Shoreline survey reports to be submitted to the Control Agency IMT at completion of assessments. All raw data collected will be included as appendices to the report and provided in a geospatial format for subsequent use in GIS mapping software.

Table 10-36: Shoreline clean-up assessment – implementation guidance

	Action	Consideration	Responsibility	Complete
Initial Actions	Ensure initial notifications to WA DoT/ NT DEPWS have been made.	Refer to **Section 7** for reporting requirements.	Environment Unit Leader	❑
	Collect and provide spill trajectory modelling, other operational monitoring data and existing sensitivity information/mapping to Control Agency for assistance in identification of priority protection areas and Operational NEBA.	Existing shoreline sensitivity mapping information for potential oil contacted locations is available on the Santos ER intranet site.	Environment Unit Leader Planning Section Chief	❑
	Actions below are indicative only and are at the final determination of the Control Agency.			
	Mobilise the AMOSC core group responders as required for industry support to Control Agency.	Refer to **Table 10-37**. Unmanned Aerial Vehicles (UAVs) may be necessary for some sensitive environments and where personnel safety is at risk (dangerous fauna in remote locations).	Incident Commander Operations Section Chief Logistics Section Chief	❑
	Conduct assessment of shoreline character, habitats and fauna.	Refer to **Table 10-35**. Refer to the WA DoT Shoreline Assessment Form for spills contact WA shorelines	AMOSC Core group and Control Agency	❑
	Conduct assessment of shoreline oiling (if present).	Refer to **Table 10-35**.	AMOSC Core group and Control Agency	❑
	Develop recommendations for clean-up activities and clean-up end points and communicate recommendations and SCAT forms back to IMT at the end of each operating period.	Refer to **Table 10-35**.	AMOSC Core group and Control Agency	❑

Table 10-37: Shoreline clean-up assessment – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Santos and industry AMOSC core group staff and responders (team leaders)	Santos Core Group Industry Core Group AMOSC staff	12 Santos core group 84 (minimum) 15	Perth, Dampier, Varanus Island and other Australian locations	<24 hours from time of shoreline contact prediction
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 OSRL – Third-Party UAV provider Local WA hire companies	Two pilots Two qualified remote pilots, however response is on best endeavour 10+	Geelong Perth Perth and regional WA	<48 hours OSRL – depending on the port of departure, one to two days if within Australia

Table 10-38: Shoreline assessment – first-strike response timeline

Task	Time from shoreline contact (predicted or observed)
IMT confirms shoreline contact prediction and begins sourcing personnel for shoreline clean-up assessment team.	<4 hours
AMOSC core group and drone pilots (shoreline clean-up assessment personnel) mobilised to deployment location.	<24 to 48 hours
Minimum Resource Requirements	
+ Two AMOSC drone pilots trained in SCAT to undertake initial reconnaissance surveys + Two AMOSC drones + Minimum two AMOSC core group personnel to undertake initial vessel or ground surveys.	

10.9 Environmental performance

Table 10-39: Environmental performance – monitor and evaluate

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
Monitor and Evaluate – vessel and aerial surveillance	**Response preparedness**		
	Maintenance of Master Services Agreements (MSAs) with multiple vessel providers	Santos maintains MSAs with multiple vessel providers as specified in **Table 10-3**.	MSAs with multiple vessel providers
	MSA with aircraft supplier	MSA in place with helicopter provider throughout activity	MSA with aircraft suppliers
	Santos trained Aerial Observers	Santos maintains a pool of trained aerial observers	Exercise Records Training Records
	AMOSC contract to facilitate mutual aid arrangements for access to Trained Aerial Observers	Maintenance of AMOSC contract to facilitate mutual aid arrangements for access to Trained Aerial Observers	AMOSC Participating Member Contract
	Access to certified UAV providers	Maintenance of contract for access to UAV providers	Maintenance of contract with service provider
	Aircraft charter companies for fauna observations	Maintain a list of aircraft charter companies that could potentially provide fauna observation services	List of providers
	Response implementation		

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
	Vessel surveillance	Minimum first-strike resource requirements mobilised in accordance with **Table 10-4**	Incident log
		Daily observation reports submitted to IMT until termination criteria is met	Incident log
	Vessels and aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003)	Vessels 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 the risk of collision with marine fauna	Vessel contractor procedures align with Santos's Protected Marine Fauna Interaction and Sighting Procedure
		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	Minimum first-strike resource requirements mobilised in accordance with **Table 10-8**	Incident log
		Following initiation two passes per day of spill area by observation aircraft provided	Incident log; Incident Action Plan

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
		Trained Aerial Observers supplied from Day 2 of response	Incident log
		Flight schedules are maintained throughout response	Incident Action Plan
		Observers completed aerial surveillance observer log following completion of flight	Aerial Observer Logs
Monitor and Evaluate – tracking buoys	**Response preparedness**		
	Tracking buoys available	Maintenance of 10 tracker buoys throughout the activity	Computer tracking software Tracker buoy tests
	Response implementation		
	Tracking buoy mobilisation	Minimum requirements mobilised in accordance with **Table 10-11**	Incident log
Monitor and Evaluate – oil spill modelling	**Response preparedness**		
	Maintenance of contract for emergency response modelling	Maintenance of contract for forecast spill trajectory modelling services throughout activity	Modelling services contract
		Access to additional spill modelling capability to ensure redundancy.	Membership in place with OSRL
	Response implementation		
	Oil spill modelling	Oil Spill Modelling provider will be contacted immediately (within two hours) upon notification of a Level 2 or 3 spill	Incident log
		Modelling delivered to IMT within two hours of request to service provider	Incident log
Monitor and Evaluate – satellite imagery	**Response preparedness**		
	Satellite imagery	Maintain membership with AMOSC and OSRL to enable	Membership contracts with AMOSC and OSRL

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Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
		access and analysis of satellite imagery	
	Response implementation		
	Satellite imagery	Data incorporated into Common Operating Picture and provided to spill modelling provider	Incident log; Incident Action Plan
Monitor and Evaluate – oil characterisation and operational water quality monitoring	**Response preparedness**		
	Maintenance of Monitoring Service Provider contract for water quality monitoring services	Maintain access to specialist monitoring personnel and equipment by maintaining contract with Monitoring Service Provider throughout activity as per **Table 10-23**	Contract with monitoring service provider
	Capability reports from Monitoring Service Provider	Obtain monthly capability reports from Monitoring Service Provider	Capability reports
	Entrained oil monitoring equipment and services	Maintenance of arrangements to enable access to fluorometry services throughout activity	Arrangement with provider of fluorometry equipment
	Water quality monitoring vessels	Maintenance of vessel specification for Water quality monitoring vessels	Vessel specification
	Oil and water quality monitoring equipment	Oil sampling kit pre-positioned at Dampier	Evidence of deployment to site
	Response implementation		
	Initial Oil Characterisation	Minimum requirements mobilised in accordance with **Table 10-24**	Incident log
		Oil samples sent to laboratory for initial fingerprinting	Incident log
		Oil samples to be sent immediately for laboratory ecotoxicity testing of oil	Incident log

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
		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
	Operational oil and oil in water monitoring	IMT activates monitoring service provider within four hours	Incident log
		Operational water quality sampling and analysis surveys mobilised within 72 hours of approval	Incident log
		Fluorometry surveys mobilised within 72 hours of initiation	Incident log
		Daily report including fluorometry results provided to IMT	Incident log
Monitor and Evaluate – shoreline clean-up assessments	**Response Preparedness**		
	SCAT trained personnel are available	Access to SCAT trained personnel capability as outlined in **Table 10-37** and **Table 10-38.** Maintain capability throughout activity through AMOSC Core Group, DoT State Response Team, AMSA National Response Team and OSRL	AMOSC Participating Member Contract, MoU for access to National Plan resources through AMSA, OSRL Associate Contract
	Response Implementation		
	Shoreline assessment	SCAT trained personnel are mobilised as per the numbers and deployment schedules provided in **Table 10-38**	Incident Log
		SCAT will be implemented under the direction of the Control Agency	Incident Log

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
		SCAT Team Leader positions will be filled with personnel trained in shoreline clean-up assessment techniques	Training records
		Santos will make available AMOSC Core Group Responders for SCAT Team Leader positions to the Control Agency	Incident Log
		SCAT reports provided to the IMT daily detailing the assessed areas to maximise effective utilisation of resources	Incident Log
	Use of shallow draft vessels for shoreline and nearshore operations	Shallow draft vessels are used for shoreline and nearshore operations unless directed otherwise by the designated Control Agency	Vessel specification documentation contained in IAP.
	SCAT Team Leader assessment/selection of vehicle appropriate to shoreline conditions	SCAT Team Leader assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met
	Conduct shoreline/ nearshore habitat/ bathymetry assessment	Unless directed otherwise by the designated Control Agency, a 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	Unless directed otherwise by the designated Control Agency) demarcation zones are mapped out in sensitive habitat areas	IAP demonstrates requirement is met

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
	Operational restriction of vehicle and personnel movement to limit erosion and compaction	Unless directed otherwise by the designated Control Agency, action plans for shoreline operations include operational restrictions on vehicle and personnel movement	IAP demonstrates requirement is met

11 Mechanical dispersion

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	
Initiation criteria	Operational monitoring 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**	**Crude**
	✓	✓
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 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, sea state, possible impacts to sensitive shorelines and/or wildlife before spill naturally disperses. This activity is to be conducted during daylight hours only and once the safety plan has been developed.	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
Vessels undertaking other activities	Santos contracted vessel providers	Availability dependent upon Santos and Vessel Contractor activities.	Vessels mobilised from Dampier. Locations verified through AIS Vessel Tracking Software.	Pending 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		
Response strategy	**Control measures**	**Performance standard**	**Measurement criteria**
Mechanical dispersion	**Response preparedness**		
	Mechanical Dispersion Plan Safety Plan Operational NEBA	Mechanical dispersion is to be conducted during daylight only, once the safety plan has been developed and operational NEBA confirms suitability and environmental benefit	Incident log IAP

12 Shoreline protection and deflection plan

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

Table 12-1: 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 priorities	
Initiation criteria	+ Level 2 or Level 3 spills where shorelines with identified or potential protection priorities will potentially be contacted + Approval has been obtained from the relevant Control Agency to initiate the response strategy	
Applicable hydrocarbons	**MDO**	**Crude**
	✓	✗
Termination criteria	+ NEBA has determined that this strategy is unlikely to result in an overall benefit to the affected shoreline/s + Agreement is reached with Jurisdictional Authorities to terminate the response strategy	

12.1 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 **Section 4.2**).

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 operational monitoring including shoreline clean-up assessments and assessed through an Operational NEBA will guide the selection of protection and deflection locations and techniques.

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 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.

12.2 Implementation guidance

Table 12-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 12-3** 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 12-4**. The Incident Commander of the Control Agency's IMT (once they assume control) is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 12-2: 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 7** for reporting requirements.	Environment Unit Leader	❑
	Collect and provide spill trajectory modelling, other 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 (**Section 10.8**).	Pre-existing TRPs exist for the Priority Protection Area for this activity, further described in **Section 6.5.1.** TRPs are available on the Santos ER Intranet page[13].	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	Operations Section Chief Planning Section Chief Environment Unit Leader	❑

[13] 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
		+ 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 + 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	❑

Action		Consideration	Responsibility	Complete
	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 procured on an as needs basis from existing human resource suppliers.	Shoreline Response Programme Manager	❑

Table 12-3: Shoreline protection and deflection – resource capability

Equipment Type/ Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
AMSA nearshore boom/skimmer equipment	AMSA	Canadyne inflatable Structureflex inflatable Versatech zoom inflatable Slickbar – solid buoyancy Structureflex – solid buoyancy Structureflex – land sea	Karratha – 5 Karratha – 10; Fremantle – 15 Karratha – 5; Fremantle – 13 Karratha – 2 Karratha – 3; Fremantle – 10 Karratha – 30; Fremantle – 30, other locations around Australia	Access to National Plan equipment through AMOSC For mobilisation timeframes refer to **Table 10-12**
AMOSC nearshore boom and skimming equipment'	AMOSC	Beach Guardian (98 × 25 m lengths) Zoom Boom (199 x 25 m lengths) HDB Boom (two 200 m lengths) Curtain Boom (58 x 30 m lengths) Skimmers: Passive Weir GT 185 Desmi 250 Weir Ro-skim Weir boom	Broome – 4; Exmouth – 20; Fremantle – 23; Geelong – 51 Broome – 8; Exmouth – 20; Fremantle – 30; Geelong – 141 Broome – 2 Fremantle – 18; Geelong – 40 Exmouth – 1; Fremantle – 1; Geelong – 1 Exmouth – 1; Geelong – 1 Geelong – 1 Geelong – 2	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**
Santos owned nearshore boom/skimming equipment	Santos	Beach Guardian (8 x 25 m lengths) Zoom Boom (16 x 25 m lengths) 2 x Desmi DBD16 brush skimmer	Varanus Island (VI) VI One each: Dampier and VI	Within 12 hours for deployment by vessel from VI

Equipment Type/ Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Personnel (field responders) for OSR strategies	AMOSC Staff	15	Fremantle – 5 Geelong – 10	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)	12	Perth/NW Australia facilities – 10 Port Bonython (South Australia) – 2	From 24 hours
	AMOSC Core Group (Industry)	As per monthly availability (minimum 84)	Office and facility location across Australia	Location dependent. Confirmed at time of activation

Table 12-4: 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 sensitivity/s 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	<60-72 hours (weather/daylight dependent)
Minimum Resource Requirements	
NB: 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, including Imperieuse Reef and are available on the Santos ER Intranet page [14]. 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 + Waste storage equipment + One Protection and Deflection Team + Personal protective equipment	

[14] 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

12.3 Environmental performance

Table 12-5 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 12-5: Environmental performance – shoreline protection and deflection

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Shoreline Protection and Deflection	**Response Preparedness**		
	Access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan and OSRL	Maintenance of access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity as per **Table 12-3**.	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
	Small vessel providers for nearshore booming operations	Maintenance of a list of small vessel providers for North West Region	List of small vessel providers
	Response Implementation		
	Mobilisation of minimum requirements for initial response operations	Minimum requirements mobilised in accordance with **Table 12-4** unless directed otherwise by Control Agency	Incident log
	Shoreline Protection and Deflection Plan	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 likely to result in a net environmental benefit	Records indicate operational NEBA completed prior to shoreline protection and deflection activities commencing
		IAP Shoreline Protection and Deflection Sub-plan developed to provide oversight and management of shoreline protection and deflection operation	Records indicate IAP Shoreline Protection and Deflection Sub-plan prepared prior to shoreline protection and deflection operations commencing

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		NEBA undertaken each operational period by the relevant Control Agency to determine if response strategy is continuing to have a net environmental benefit. NEBA included in development of following period Incident Action Plan	IAP/Incident Log
		Ensure operational NEBA considers waste management, to ensure environmental benefit outweighs the environmental impact of strategy implementation which may include secondary contamination	Incident Log IAP
	Spill response activities selected on basis of a Net Environmental Benefit Analysis	A NEBA is undertaken for every operational period	Incident Log contains NEBA
	Use of shallow draft vessels for shoreline and nearshore operations	Shallow draft vessels are used for shoreline and nearshore operations, unless directed otherwise by the designated Control Agency	Vessel specification documentation contained in IAP.
	Conduct rapid shoreline/nearshore habitat/bathymetry assessment	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

13 Shoreline clean-up plan

Table 13-1: 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 priorities 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**	**Crude**
	✓	✗
Termination criteria	+ As directed by DoT	

13.1 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 (**Section 10.8**) 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 Operational Monitoring (refer **Section 10**), 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 Mutineer-Exeter Cessation of Production activities, that only small volumes of MDO may contact shorelines (**Table 6-4**). Modelling did not predict shoreline contact for the LOWC scenario (**Table 6-3**).

Both types of hydrocarbon are light and volatile with a low proportion of residue following weathering. These hydrocarbons are difficult to handle for removal given their light nature but are readily washed from sediments by wave and tidal flushing; contaminated sand and debris the likely waste products from a shoreline response.

Shoreline clean-up techniques include:

+ Shoreline Clean-up Assessment – uses assessment processes (refer to **Section 10.8**) to assess shoreline character, assess shoreline oiling and develop recommendations for response. Typically, this should 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.

13.2 Implementation guidance

Table 13-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy. **Table 13-2** provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 13-3** 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 13-4**. 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 13-2: 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 **Section 10.8** 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 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	❑

	Action	Consideration	Responsibility	Complete
	If 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. Refer to IPIECA-IOGP (2015) for additional guidance on shoreline clean-up planning and implementation.	Environment Unit Leader Planning Section Chief Operations Section Chief	❑

	Action	Consideration	Responsibility	Complete
	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 (as per the MoU agreement between Santos and AMSA). 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 Programme Manager Operations Section Chief	❑
Ongoing Actions	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	❑

Action		Consideration	Responsibility	Complete
	Monitor progress of clean-up efforts and report to the Control Agency.		Operations Section Chief On-Scene Commander Deputy OSC (Control Agency FOB)	❑

Table 13-3: Shoreline clean-up – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Manual clean-up tools (shovels, rakes, wheelbarrows, bags, etc.)	AMOSC shoreline kits	Shoreline support kits first-strike	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	One shoreline clean-up container	Varanus Island	Within 12 hours for deployment from VI
	Hardware suppliers	As available	Karratha, Exmouth, Perth	
Shoreline flushing (pumps/hoses)	AMOSC	Shoreline flushing kit Shoreline impact lance kit	Fremantle –1; Geelong – 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**

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Nearshore skimmers/hoses	AMOSC AMSA	Refer to Protection and Deflection (**Table 12-3**)		
Decontamination/staging site equipment	AMOSC	Decontamination station – 3	Fremantle –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**
	AMSA	Decontamination station – 4	Karratha –2; Fremantle – 2	Access to National Plan equipment through AMOSC
	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)) Vikotank (13,000 L) Lamor (11,400 L) IBCs (1 m^3)	Broome –1; Geelong –4; Fremantle –2; Exmouth – 2 Broome – 1; Geelong – 1; Fremantle – 4; Geelong – 13	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**
	AMSA temporary storage	Fast tanks – (10 m^3)	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 Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
		Structureflex – (10 m^3) Vikoma – (10 m^3)	Brisbane – 1; Adelaide – 2; Darwin – 1; Adelaide – 1; Brisbane – 1; Devonport – 2; Fremantle – 4; Fremantle – 3; Melbourne – 2; Sydney – 2; Townsville – 4	
	Santos Waste Management Service Provider	Refer to Waste management **(Section 15)**	Karratha, Broome, Perth	24+ hours
Personnel (field responders) for OSR strategies	AMOSC Staff	15	Fremantle – 5 Geelong – 10	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)	12	Perth/NW Australia facilities – 10 Port Bonython (South Australia) – 2	12+ hours
	AMOSC Core Group (Industry)	As per monthly availability (minimum 84)	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 13-4: 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	
NB: Resource requirements for shoreline clean-up will be situation/receptor specific. If developed for the area/receptor, TRPs will outline suggested resource requirements and shoreline assessments (as part of operational monitoring strategy) to 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) + 10–25 shoreline clean-up responders (AMOSC Core Group, Santos contracted labour hire personnel).	

13.3 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.

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 (**Section 10.8**) will provide information to guide the clean-up strategy and deployment of resources.

13.4 Remote islands deployment

For shoreline clean-up of remote islands, 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, Pilbara Region Oiled Wildlife Response Plan 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 clean-up containers (contents list in **Appendix J: Shoreline Clean-up Equipment**) to shoreline contact locations defined by IMT through observation data; or if locations are too sensitive to be using as staging sites, then transfer equipment via 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 small squads (size of team to be determined by Team Leader) 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.
4. Deploy the waste pickup barges to retrieve collected wastes from the temporary bunding and to complete the shoreline clean-up and final polishing.

13.5 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: Shoreline Response Strategy Guidance**.

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: Operational Guidelines for Shoreline Response.**

The WA DoT Oil Spill Contingency Plan (2015) also provides guidance on shoreline clean-up techniques.

13.6 Environmental performance

Table 13-5 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 13-5: 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 priorities and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Shoreline Clean-Up	**Response Preparedness**		
	Access to shoreline clean-up equipment and personnel through AMOSC, AMSA National Plan and OSRL	Maintenance of access to shoreline clean-up equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity. Maintain capability throughout activity through AMOSC Core Group, DoT State Response Team, AMSA National Response Team and OSRL	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
			Labour hire contract
	Maintenance of MSAs with multiple vessel providers	Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	Vessels for offshore island response	Maintenance of vessel specification for resource transfer for offshore island response	Vessel Specification
	Labour hire contract	Maintenance of contract with labour hire provider	Contract
	Response Implementation		
	Mobilisation of minimum requirements for initial response operations	Minimum requirements mobilised in accordance with **Table 13-4** unless directed otherwise by the Control Agency	Incident Log
	Shoreline Clean-Up Plan	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	Records indicate operational NEBA completed prior to shoreline clean-up activities commencing
		Ensure operational NEBA considers waste management, to ensure environmental benefit outweighs the environmental impact of strategy implementation which may include secondary contamination	Incident Log IAP

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		IAP Shoreline Clean-up Sub-plan developed to provide oversight and management of shoreline clean-up operation	Records indicate IAP Shoreline Clean-up Sub-plan prepared prior to shoreline clean-up operations commencing
		Clean-up strategies will be implemented under the direction of the Control Agency	Incident Log
		Santos will make available to the Control Agency Shoreline Supervisor/Specialist personnel from AMOSC/OSRL for shoreline clean-up team positions.	Incident Log
		Santos will make available to the Control Agency equipment from AMOSC and OSRL stockpiles	Incident Log
		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
	Prioritise use of existing roads and tracts	Unless directed otherwise by the designated Control Agency, access plans for shoreline operations will prioritise use of existing roads and tracks	IAP demonstrates requirement is met
	Soil profile assessment prior to earthworks	Unless directed otherwise by the designated Control Agency, a soil profile assessment is conducted prior to earthworks	Documented in IAP and Incident Log
	Pre-cleaning and inspection of equipment (quarantine)	Vehicles and equipment provided by Santos are verified as clean and invasive species free prior to deployment to offshore islands	Documented in IAP and Incident Log

Santos

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	Use of Heritage Adviser if spill response activities overlap with potential areas of cultural significance	Unless directed otherwise by the designated Control Agency, a Heritage Adviser is consulted if shoreline operations overlap with areas of cultural significance	Documented in IAP and Incident Log
	Select temporary base camps in consultation with DoT and DBCA	Any establishment of forward staging areas at shoreline areas done under direction or in consultation with the Control Agency	Documented in IAP and Incident Log
	OSR Team Leader assessment/selection of vehicle appropriate to shoreline conditions	OSR Team Leader assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met
	Establish demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat	Unless directed otherwise by the Control Agency, demarcation zones are mapped out in sensitive habitat areas	IAP demonstrates requirement is met
	Operational restriction of vehicle and personnel movement to limit erosion and compaction	Unless directed otherwise by the Control Agency, action plans for shoreline operations include operational restrictions on vehicle and personnel movement	IAP demonstrates requirement is met
	Stakeholder consultation	Consultation is undertaken with relevant stakeholders prior to deployment of resources to townships and marine/coastal areas	Consultation records

14 Oiled wildlife

Note: the WA DoT is the Control Agency and DBCA is the Jurisdictional Authority 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 14-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 14-1: Oiled wildlife response – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement tactics in accordance with relevant Santos/ State Oiled Wildlife Response Plans (OWRP) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife
Initiation criteria	Operational monitoring shows that wildlife are contacted or are predicted to be contacted by a spill
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

14.1 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 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 under scientific monitoring (**Section 16**).

Table 14-2 provides guidance on the designated control agency and jurisdictional authority for Commonwealth and State waters for OWR. For a petroleum activity spill in Commonwealth waters, Santos act as the control agency and will be responsible for the wildlife response. The Santos Oiled Wildlife Response Framework Plan (SO-91-BI-20014) will be referred to for guidance for coordinating an OWR when Santos is the Control Agency, otherwise the relevant State OWR Plan will be referred to, as described below.

If a spill occurs in WA State waters or 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 Department of Transport (DoT). For level 1 spills, Santos will be the Control Agency, including for wildlife response. It is however also 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.

The key plan for OWR in WA is the Western Australian Oiled Wildlife Response Plan (WAOWRP). 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 State Hazard: SHP-MEE. It is the responsibility of DBCA to administer the WAOWRP under the direction of the DoT (**Table 14-2**).

Table 14-2: 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 (three to 200 nautical miles from territorial/state sea baseline)	Vessel	Department of Agriculture, Water and the Environment (DAWE)	AMSA		
	Petroleum activities		Titleholder		
Western Australian (WA) state waters (State waters to three nautical miles and some areas around offshore atolls and islands)	Vessel	Department of Biodiversity, Conservation and Attractions (DBCA)	WA DoT[15]		Western Australian Oiled Wildlife Plan (WAOWRP)
	Petroleum activities	WA DoT	Titleholder	WA DoT	

14.2 Wildlife response levels

The credible spill scenarios for MEFF Cessation of Production activities show minimal shoreline contact, and large aggregations of wildlife are not expected or known to occur within the moderate exposure thresholds zone of a potential MEFF Cessation of Production spill release. Consequently, at most a level 2 wildlife response, as defined in the WAOWRP (DBCA & AMOSC, 2014) (**Table 14-3**), is anticipated for planning purposes.

[15] 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.

Table 14-3: Indicative oiled wildlife response level (adapted from Western Australian Oiled Wildlife Response Plan, 2014)

OWR Level	**Indicative personnel numbers**	**Indicative duration**	**Indicative number of birds** (non-threatened species)	**Indicative number of birds** (threatened species)	**Turtles** (hatchlings, juveniles, adults)	**Cetaceans**	**Pinnipeds**	**Dugongs**
Level 1	6	<3 days	1–2/day <5 total	None	None	None	None	None
Level 2	26	>4–14 days	1–5/day <20 total	None	<20 hatchlings No juv/ adults	None	None	None
Level 3	59	>4–14 days	5–10/day	1–5/day <10 total	<5 juv/ adults <50 hatchlings	None	<5	None
Level 4	77	>4–14 days	5–10/day <200 total	5–10/day	<20 juv/ adults <500 hatchlings	<5, or known habitats affected	5–50	Habitat affected only
Level 5	116	>4–14 days	10–100/ day >200 total	10–50/day	>20 juv/ adults >500 hatchlings	<5 dolphins	>50	Dugongs oiled
Level 6	122	>4–14 days	>100/day	10–50/day	>20 juv/ adults >500 hatchlings	>5 dolphins	>50	Dugongs oiled

14.3 Implementation guidance

Table 14-4 provides guidance to the IMT on the actions and responsibilities that should be considered when implementing an oiled wildlife first-strike plan. This will enable an initial assessment of the OWR response level and initiation of a Wildlife Division for wildlife level 2/3 spills (**Table 14-3**) where Santos is the control agency and as outlined in the Santos Oiled Wildlife Response Framework Plan (SO-91-BI-20014). Mobilisation times for the minimum resources that are required to commence initial oiled wildlife operations are listed in **Table 14-5**. Information on resource capability for this strategy is shown in **Appendix M: Oiled wildlife response personnel and equipment.**

Wildlife surveillance/reconnaissance will likely form the main component of an OWR associated with a MEFF Cessation of Production spill. Refer to Section 7.3 in the Santos Wildlife Framework Plan for a list of the wildlife reconnaissance aims and objectives, tactics, species and life-cycle stages to consider when developing a wildlife reconnaissance plan. Wildlife reconnaissance should be undertaken in close consultation with personnel undertaking relevant monitor and evaluate activities.

Table 14-4: Implementation guidance – oiled wildlife response

	Action	Consideration	Responsibility	Complete
Initial wildlife assessment and notifications				
Initial actions	Personnel conducting monitor and evaluate activities shall report wildlife sightings in or near the spill trajectory (including those contacted with hydrocarbons or at risk of contact) and report them to the IMT within two hours of detection.	Record all reports of wildlife potentially impacted and impacted by spill. Record reports on: + location + access + number + species + condition of impacted animals (if available).	Surveillance personnel	❑
	If wildlife are sighted and are at risk of contact (or have been contacted), initiate wildlife response by notifying AMOSC Duty Manager; and + if in State waters also notify DBCA State Duty Officer (who will then activate their respective Oiled Wildlife Advisers).	Obtain approval from IC before activating AMOSC Oiled Wildlife Adviser. DoT will be the control agency for OWR in State waters.	Environment Unit Leader	❑
	Notify Department of Agriculture, Water and the Environment if there is a risk of death or injury to a protected species (including Matters of National Environmental Significance [MNES]).	Refer to **Table 7-1** for reporting requirements. A list of MNES is provided in the Existing Environment Section of the EP (Appendix C).	Environment Unit Leader	❑
	Review all wildlife reports from surveillance or opportunistic activities and contact personnel who made the reports (if possible) to confirm information collected.		Environment Unit Leader Wildlife Response Branch Director	❑

	Action	Consideration	Responsibility	Complete
	Use information from initial assessments to prepare an operational NEBA. Use this information to help determine: + initial OWR Response Level (1 to 6), see **Table 14-3** + For level 2/3 wildlife incidents where Santos is the control Agency, a Wildlife Division should be established (see the Santos Oiled Wildlife Framework Plan [SO-91-BI-20014]) + if OWR activities are likely to result in a net environmental benefit + prepare a Wildlife Plan for inclusion in the IAP.	Oiled wildlife response activities such as hazing and pre-emptive capture can cause additional stress and mortality on individuals than oil pollution alone. The Environment Unit Leader and Wildlife Division Coordinator will determine via an operational NEBA whether strategies such as hazing/pre-emptive capture will result in a net environmental benefit. This may be done in consultation with the DBCA and AMOSC Oiled Wildlife Advisers and any Subject Matter Experts as relevant (if available, but an operational NEBA should not be delayed if they are not immediately available).	Environment Unit Leader If Wildlife Division activated: Wildlife Division Coordinator Wildlife Branch Director	❑
	Prepare a Wildlife Plan for inclusion in the IAP	Refer to the Santos Oiled Wildlife Framework Plan (SO-91-BI-20014), Section 7.1	Environment Unit Leader If Wildlife Division activated: Wildlife Division Coordinator Wildlife Branch Director	❑
Mobilisation of wildlife resources				
Determine resources required to undertake wildlife reconnaissance and provide list to Logistics Section.		Confirm best reconnaissance platform (e.g. vessel, aerial, shoreline). Consider ability to share resources (e.g. Monitor and Evaluate activities, Scientific Monitoring).	AMOSC OWA If Wildlife Division activated: Wildlife Division Coordinator Wildlife Reconnaissance Officer	❑

Action	Consideration	Responsibility	Complete
Determine number of Oiled Wildlife Responders and IMT Wildlife related positions required based on the likely number of oiled wildlife and arrange access to resources via AMOSC, DBCA and/or DEPWS.	Consider need for veterinary care.	AMOSC OWA Logistics Section Chief If Wildlife Division activated: Wildlife Division Coordinator State waters: DBCA OWA	❑
Commence mobilisation of equipment (including adequate PPE) and personnel to required location/s.		Logistics Section Chief	❑
Contact OSRL to activate Sea Alarm if additional support is likely to be required to sustain an ongoing OWR.		Environment Unit Leader	❑

Table 14-5: 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. Indicative minimum resource requirements below align with personnel requirements for a scenario with low wildlife impact as per the WAOWRP: + Six trained industry oiled wildlife response team personnel (AMOSC staff & contractors/ AMOSC Industry OWR group) + One AMOSC OWR treatment container + One AMOSC Oiled Wildlife Deterrence Kit	

14.4 Environmental performance standards

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

Table 14-6: Environmental performance – oiled wildlife response

Environmental performance outcome	Implement tactics in accordance with relevant State Oiled Wildlife Response Plans (OWRP) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
Oiled wildlife response	**Response preparedness**		
	Maintenance of access to oiled wildlife response equipment and personnel	Maintenance of access to oiled wildlife response equipment and personnel through Santos, AMOSC, AMSA National Plan and OSRL throughout activity	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract.
			OSRL Associate Member Contract.
	Santos Oiled Wildlife Framework Plan (SO-91-BI-20014)	Santos Oiled Wildlife Response Framework provides guidance for coordinating an OWR when Santos is the control agency and	Santos Wildlife Framework Plan

Environmental performance outcome	Implement tactics in accordance with relevant State Oiled Wildlife Response Plans (OWRP) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
		outlined Santos's response arrangements	
	Labour hire contract	Maintenance of contract with labour hire provider	Contract
	Labour hire onboarding procedure (for low skilled shoreline clean-up- personnel)	Development of onboarding procedure for oil spill response labour hire	Onboarding procedure
	Maintain Santos personnel trained on OWR and positioned at Perth and VI	Santos personnel trained in OWR	Training records
	Response implementation		
	Mobilisation of minimum requirements for initial response operations	Minimum requirements mobilised in accordance with **Table 14-5** unless directed otherwise by relevant control agency	Incident log
	OWR managed in accordance with the Santos Oiled Wildlife Framework Plan (SO-91-BI-20014) in Commonwealth, and the WAOWRP in state waters.	Prepare operational NEBA to help classify OWR level and determine if OWR activities are likely to result in a net environmental benefit (particularly in relation to hazing/pre-emptive capture)	Records indicate operational NEBA completed before OWR operations commencing
		Wildlife Plan developed and included in the IAP to provide oversight and management of OWR operation	Records indicate IAP Wildlife Plan prepared before OWR operations commencing

15 Waste management

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

Table 15-1: 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**	**Crude**
	✓	✓
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	

15.1 Overview

The implementation of some spill response strategies will generate waste 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.

The worst-case oil spill modelling conducted for MEFF Cessation of Production predict minimal shoreline accumulation of surface oil for MDO and no shoreline contact >100 g/m^2 for Mutineer-Exeter crude. Potential waste management requirements are therefore likely to be limited to oiled wildlife response and water quality monitoring activities. Significant volumes of waste from the applicable response activities for this OPEP are not anticipated due to the propensity of MDO and Mutineer-Exeter crude to disperse naturally, although there may be some limited volumes of oiled sediment and/or PPE waste if a shoreline clean-up response is implemented.

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 (QE-91-IF-10053) provides detailed guidance to the WSP in the event of a spill.

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. 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 15-2: 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 Contacts 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.	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 (QE-91-IF-10053)).	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 (QE-91-IF-10053); and where relevant, the DoT Waste Management	Logistics Section Chief (or delegate) Planning Section Chief	❑

	Action	Consideration	Responsibility	Complete
		Guidelines (WA), the respective Port, Port Operator and/or Ship Owner's waste management plan.	WSP location Responsible Person or Operations Supervisor	
	Mobilise waste management resources and services to agreed priority locations.		WSP location Responsible Person or Operations Supervisor Logistics Section Chief	❑
Ongoing actions	Provide ongoing point of contact between IMT & WSP.		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 (QE-91-IF-10053); and where relevant, the DoT Waste Management Guidelines (WA), the respective Port, Port Operator and/or Ship Owner's waste management plan.	WSP location Responsible Person or 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 location Responsible Person or Operations Supervisor	❑

15.3 Waste approvals

Site clean-up, removal and disposal of response waste should be conducted in accordance with Santos' Oil Pollution Waste Management Plan (QE-91-IF-10053); 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. The Santos Oil Pollution Waste Management Plan (QE-91-IF-10053) 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.

15.4 Resource requirements

Based on the credible spill scenarios for the MEFF Cessation of Production, Santos do not anticipate that large volumes of waste will be generated. The potential types and total volumes of waste anticipated for each response option are provided in **Table 15-3**.

Table 15-4 summarises the waste storage, treatment and disposal options available to manage waste associated with the spill response options.

Given that large volumes of a waste are not anticipated, storage space on the spill response vessels is anticipated to be adequate. However, as soon as the details of an actual spill are available, waste management arrangements to allow a continuous response to be maintained should be reviewed.

The waste products are likely to be transported by vessel from the response location to Dampier Port. Waste will be transported from Dampier Port to licensed waste disposal facilities by a dedicated waste contractor. Santos has existing service agreements with a WSP which include the provision of waste management services during a spill response. Transport to the licensed waste management facilities would be undertaken via controlled-waste-licensed vehicles and in accordance with the *Environmental Protection (Controlled Waste) Regulations 2004*.

Table 15-3: Waste types and volumes anticipated during a spill response

Spill response option	Oily liquid waste	Solid oily waste	PPE and consumables
Monitor and evaluate	None	None	<1 m^3/day
Mechanical dispersion	None	None	<1 m^3/day
Shoreline clean-up[16]	<1 m^3/day	<3 m^3/day	<2-4 m^3/day
Wildlife response	<1 m^3/day	<2 m^3/day	<4–6 m^3/day

[16] Based on one small clean-up team of 4-6 people removing approximately 1 m^3/person/day

Table 15-4: Spill response waste storage, treatment and disposal options

Waste category	On-site storage	Treatment/disposal option
Liquid waste (e.g. recovered oil/water mixture)	Holding on vessels, oil drums, tanks, oil barges and flexible bladders	Wastewater treatment process and discharge (e.g. dust suppression) Incineration
Solid waste – oiled organic matter/sediment, PPE and consumables (e.g. oily gloves)	Lined skips, oil drums, industrial waste bags, plastic rubbish bags	Recovery (e.g. thermal desorption or fixation process) and recycling Incineration Landfill
Oiled wildlife response	Industrial waste bags, plastic rubbish bags	Incineration Landfill

15.5 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 (QE-91-IF-10053).

Key responsibilities of the WSP include:

+ Maintain emergency response standby preparedness arrangements, including:
  - Have 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.
  - Have 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).

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 – 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**		
	Maintain access to waste management equipment, personnel, transport and disposal facilities	Maintain access to waste management equipment, personnel, transport and disposal facilities throughout activity	Contract with WSP for emergency response services
	Response implementation		
	Implement Oil Pollution Waste Management Plan (QE-91-IF-10053)	WSP to appoint a Project Manager within 24 hours of activation	Incident log
		WSP shall track all wastes from point of generation to final destination	Waste tracking records
		WSP to provide monthly waste management reports and more regular situation reports during the response until termination criteria are met	Waste reports

16 Scientific monitoring

Table 16-1: Scientific monitoring – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement monitoring programs to assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response	
Initiation criteria	Refer to individual Receptor SMPs –**Appendix N: Scientific monitoring plans**	
Applicable hydrocarbons	**MDO**	**Crude**
	✓	✓
Termination criteria	Refer to individual SMPs – **Appendix N: Scientific monitoring plans**	

Oil spill scientific monitoring is the principal tool for detecting and quantifying environmental impact and recovery to sensitive receptors from an oil spill. Santos is required to have an oil spill SMP in place for Petroleum activities in State and Commonwealth waters.

Santos will activate and implement scientific monitoring in State and Commonwealth waters for hydrocarbon spills in line with its SMPs unless directed otherwise by the relevant Control Agency/s.

16.1 Objectives

The overarching objective of Santos' SMPs is to provide guidance to staff, consultants and contractors in developing monitoring a monitoring program for detecting impacts and recovery to environmentally sensitive receptors contacted by a spill.

Receptor-specific SMPs have different objectives as outlined in **Appendix N: Scientific monitoring plans**.

16.2 Scope

Santos will implement its SMPs, as applicable, for MEFF Cessation of Production activity oil spills across both State and Commonwealth waters. In the event that control of scientific monitoring in State waters is taken over by DoT under advice from the State Environmental Scientific Coordinator, Santos will follow the direction of DoT and provide all necessary resources (monitoring personnel, equipment and planning) to assist as a supporting agency.

16.3 Relationship to operational monitoring

Operational monitoring (**Section 10**) is monitoring undertaken to obtain information which will provide situational awareness and assist in the planning and execution of the oil spill response.

Scientific monitoring activities have different objectives to operational monitoring**,** which influences the monitoring methods likely to be used, the degree of scientific rigour required to meet the monitoring objectives, and the scope of studies. Scientific monitoring may occur in parallel to operational monitoring and is typically conducted over a wider study area, extending beyond the spill footprint. It is also typically conducted over a longer time period, extending beyond the spill response.

Scientific monitoring is designed to provide data for short-term and longer-term environmental effects assessment. This is typically required to be quantitative in nature and appropriate for statistical analyses. However, these two types of monitoring are related, and Operational Monitoring outputs typically inform the final design of the related SMP.

16.4 Scientific monitoring plans

Owing to the diverse nature of sensitive receptors that could be contacted by an oil spill and the different techniques and skillsets required to monitor impact and recovery to these receptors, there are a number of Oil Spill Scientific Monitoring Plans relevant to MEFF Cessation of Production activities (**Table 16-2**). These are detailed further in **Appendix N: Scientific monitoring plans**; each SMP has corresponding objectives, initiation/termination criteria, methodologies, baseline data sources and analysis and reporting requirements, noting that in a response controlled by DoT methodology, termination criteria and analysis/reporting requirements may differ.

Table 16-2: Oil spill scientific monitoring plans relevant to MEFF Cessation of Production activities

Study	Title
SMP1	Marine water quality
SMP2	Marine sediment quality
SMP3	Shorelines and coastal habitats – sandy beaches and rocky shores
SMP4	Shorelines and coastal habitats – mangroves
SMP5	Shorelines and coastal habitats – intertidal mudflats
SMP6	Benthic habitats
SMP7	Seabirds and shorebirds
SMP8	Marine megafauna (incl. Whale sharks and mammals)
SMP9	Marine reptiles
SMP10	Seafood quality
SMP11	Fish, fisheries and aquaculture
SMP12	Whale sharks

16.5 Baseline monitoring

Baseline monitoring provides information on the condition of ecological receptors before, or spatially independent of (e.g. if used in control chart analyses), a spill event and is used for comparison with the post-impact scientific monitoring where required. This is particularly important for scientific monitoring where the ability to detect changes between pre-impact and post-impact conditions is necessary.

In the event of a spill to marine or coastal waters, reactive pre-impact monitoring should, where practicable, be implemented to gather additional data on the current state of the environment.

16.6 Monitoring service providers

Oil Spill Scientific Monitoring will be conducted on behalf of Santos by contracted monitoring service providers (MSPs) and applies to the implementation of SMPs 1 to 12 (**Table 16-2**). These services are provided by Astron Environmental Services (Astron) and primary sub-contractor (BMT). **Appendix P: Scientific monitoring capability** provides further information regarding Astron's capability and assurance arrangements.

For whale sharks, scientific monitoring of whale sharks (SMP12) along the Ningaloo Coast and north-west Australian coastline will be undertaken. Santos has historically and currently supports research on the behaviour, demography and migration patterns of whale sharks at Ningaloo Reef conducted by Australian Institute of Marine Science. In the event of a spill that could impact whale sharks, Santos will leverage off this long-term research program to assess potential impacts to whale sharks at, and migrating to-and-from, Ningaloo Reef. SMP12 is regarded as complementary to SMP8 which will detect potential impacts to whale sharks from visual surveys of whale sharks wherever they may occur in relation to a spill.

As per the Santos Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162), Santos' MSP provides the following scientific monitoring services to Santos:

+ 24/7 monitoring support accessed through 24-hour call-out number
+ provision of a suitably trained Monitoring Coordination Team including a Monitoring Coordinator, Monitoring Operations Officer, Planning and Logistics Officer and Safety Officer
+ provision of Technical Advisers and Field Teams (staff and contractors) for first-strike deployments
+ maintenance of standby monitoring equipment
+ monthly personnel capability reports
+ provision and review of Scientific Monitoring Sub-plans
+ provision and review of Standby Service Manual (EA-00-RI-10162) and associated response activation forms
+ participation in audits, workshops, drills and exercise to facilitate readiness.

Appendix N: Scientific monitoring plans provides an overview of Santos' processes in place to provide assurance that its oil spill scientific monitoring arrangements for SMPs 1–11 are fit-for-purpose to meet the worst-case first-strike monitoring requirements associated with the MEFF Cessation of Production activities.

16.7 Activation

The SMP Activation Process is outlined in **Appendix O: SMP activation process.** SMPs are activated as per the initiation criteria for each as outlined in **Appendix N: Scientific monitoring plans**. The SMP Activation Form is available on the Santos Procedures Index and Environment Unit Leader folder.

The Santos Environment Unit Leader with support from IMT Environment Unit members is responsible for activating the primary MSP. The Santos Environment Unit will assist the MSP Monitoring Coordination personnel and relevant Technical Advisers in defining the monitoring study design, monitoring locations and field methodologies based on Operational Monitoring information (e.g. spill modelling and aerial surveillance information), relative location of sensitive receptors to the spill and the timing of the spill with respect to seasonality of sensitive receptors.

This process will identify monitoring operational objectives and resourcing/ mobilisation requirements which the Environment Unit Leader will feed back to the IMT for approval. Mobilisation times for the minimum resources that are required to commence initial scientific monitoring operations are listed in **Table 16-3.**

In the event that a designated control agency takes command of scientific monitoring, Santos will follow the direction of the control agency providing planning and resourcing support through its MSPs as required.

Table 16-3: Scientific monitoring – first-strike response timeline

<table>
<tr><th>Task</th><th>Time from activation</th></tr>
<tr><td>Monitoring Service Provider commences activation process once initial notification form is received from Santos</td><td>30 mins</td></tr>
<tr><td>Santos IMT approve initial monitoring plan</td><td><24 hours</td></tr>
<tr><td>Santos to mobilise sampling platforms to deployment location</td><td><96 hours (72 hours from monitoring plan approval)</td></tr>
<tr><td>SMP teams and monitoring equipment mobilised to deployment locations</td><td><96 hours (72 hours from monitoring plan approval)</td></tr>
<tr><td colspan="2">Minimum resource requirements</td></tr>
<tr><td colspan="2">Initial resourcing requirements will be dependent upon the number of SMPs activated and the requirement for post-spill baseline data to be collected. First-strike personnel requirements for scientific monitoring field teams at Protection Priority areas are presented in Appendix P: Scientific monitoring capability.
+ Suitable vessels for on-water monitoring or transfer of personnel to remotes areas/islands
+ Vehicle/s as required
+ Helicopter for aerial surveys as required
+ Scientific monitoring personnel for first-strike teams (refer Appendix P: Scientific monitoring capability)
+ Scientific monitoring equipment as detailed in the relevant SMP</td></tr>
</table>

16.8 Environmental performance

Table 16-4 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 16-4: Environmental performance – scientific monitoring

<table>
<tr><th>Environmental performance outcome</th><td colspan="3">Implement monitoring programs to assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill</td></tr>
<tr><th>Response strategy</th><th>Control measures</th><th>Performance standards</th><th>Measurement criteria</th></tr>
<tr><td rowspan="2">Scientific monitoring</td><td colspan="3">Response preparedness</td></tr>
<tr><td>Maintenance of Monitoring Service Provider contract for scientific monitoring services</td><td>Maintain access to specialist monitoring personnel and equipment by maintaining contract with Monitoring Service Provider throughout activity</td><td>Contract with monitoring service provider</td></tr>
</table>

Environmental performance outcome	Implement monitoring programs to assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill		
Response strategy	**Control measures**	**Performance standards**	**Measurement criteria**
	Capability reports from Monitoring Service Provider	Obtain monthly capability reports from Monitoring Service Provider	Capability reports
	Conduct periodical review of existing baseline data sources across the Santos combined EMBA	Regular review of baseline data	Baseline data review report
	Water quality monitoring vessels	Maintenance of vessel specification for water quality monitoring vessels	Vessel specification
	Response implementation		
	Activate Scientific Monitoring Plans	Initiation criteria of SMPs will be reviewed during the preparation of the initial IAP and subsequent IAPs; and if any criteria are met, relevant SMPs will be activated	Incident Action Plan and Incident log
		If any SMPs are activated, the subsequent activation of MSP is to follow the process outlined in the Santos Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)	Incident log
		MSP shall commence activation process within 30 mins of initial notification form being received from Santos	Monitoring Service Provider records
		Santos personnel to support MSP through the provision of operational monitoring information and relative location of sensitive receptors to the spill	Incident log and Monitoring Service Provider records
	Mobilisation of minimum requirements for initial scientific monitoring operations	Minimum requirements mobilised in accordance with **Table 16-3**	Incident log

17 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 contingency 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 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 environmental monitoring requirements.

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Appendix A: Hydrocarbon characteristics and behaviour

Marine diesel oil (MDO)

ITOPF (2021) and AMSA (2015) categorises MDO as a light group II hydrocarbon. The physical characteristics of MDO are summarised in **Table A-1.** In the marine environment, a 5% residual of the total quantity of MDO spilt will remain after the volatilisation and solubilisation processes associated with weathering. For full details on the properties of MDO, see Section 7.5.3 of the MEFF Cessation of Production EP (9885-650-PLN-0001).

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

+ Diesel 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 to 80% reduction of the net hydrocarbon balance;
+ 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. 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; and
+ Diesel 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.

Figure A-1 provides the predicted weathering and fates of surface MDO. The graphs show that under low winds (1 m/s), 60% of the surface slick is predicted to remain as surface oil after 120 hours (5 days), while 40% has evaporated. Under moderate winds (5 m/s), 40% of the initial surface slick is predicted to remain as surface oil after 24 hours, decreasing further to ~10% after 48 hours and ~1% after 72 hours while the remainder has evaporated or dispersed into the water column. With high winds (10 m/s), the surface slick is predicted to almost entirely evaporate (~20–25%) or disperse (~75–80%) after 12 hours.

Table A-1: Properties of MDO (GHD, 2021)

Hydrocarbon type	Specific gravity	Viscosity at 20 °C (cSt)	API	Wax content (%)	Pour point °C	Asphaltene (%)
MDO	0.843	3.9	36.4	0.05	−36	0.05

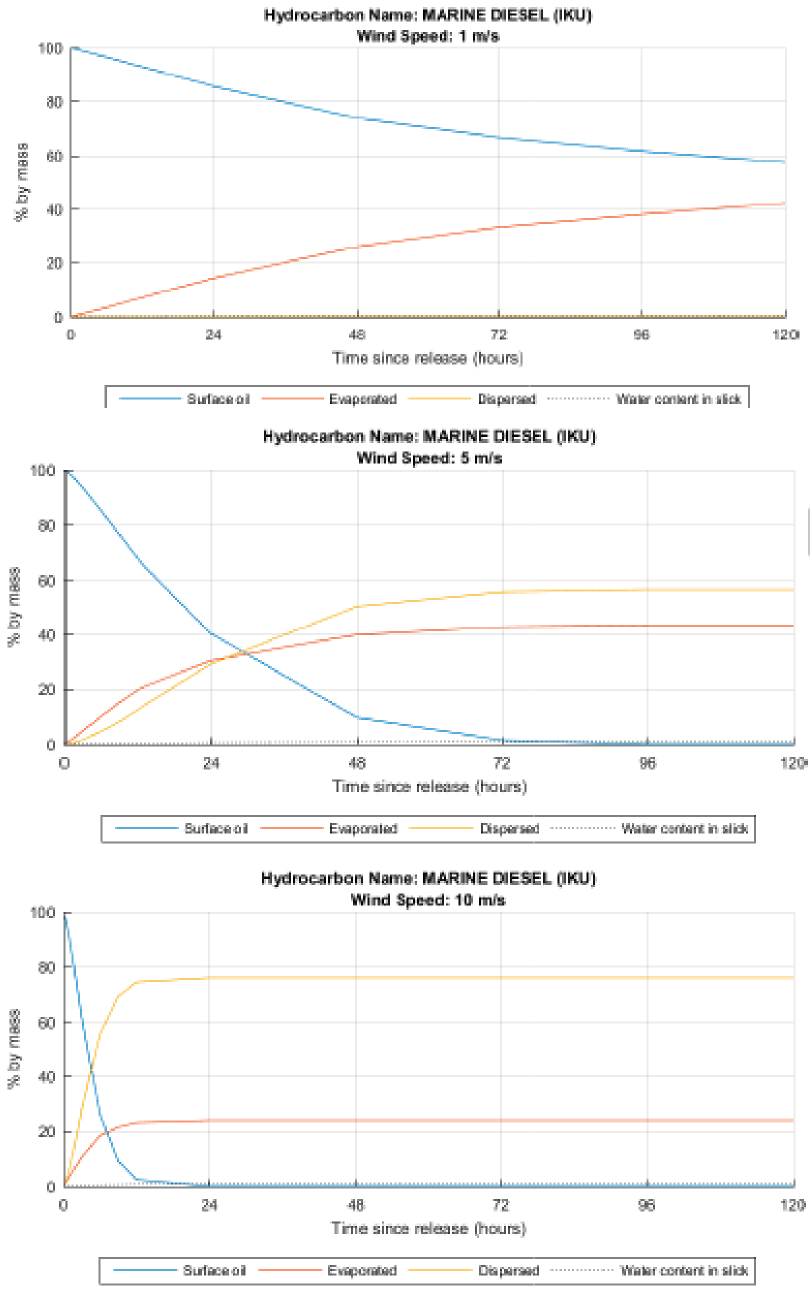


Figure A-1: Predicted weathering and fates of MDO for a 604 m^3 spill (GHD, 2021)

Mutineer-Exeter Light Crude

Mutineer-Exeter Light Crude is characterised by a low viscosity and is considered a Group II oil (light) hydrocarbon, as per the grouping classification presented by AMSA (2015). If spilt on the sea surface, the hydrocarbon would rapidly spread and thin out resulting in a large surface area of hydrocarbon available for evaporation.

Oil spill modelling was carried out with SINTEF's Oil Spill Contingency and Response (OSCAR) system (version 12.0) and required the use of a hydrocarbon analogue. SINTEFs hydrocarbon analogue 'Vale' was selected as a suitable match for Mutineer-Exeter Light Crude. The chemical properties of both hydrocarbons is outlined in **Table A-2**.

Evaporation is the primary weathering mechanism for Vale 2013. Under low wind speeds of 1 m/s, approximately 55% of the surface slick is predicted to evaporate after 5 days (120 hours) while wind-driven dispersion into the water column is negligible. Under moderate wind speeds of 5 m/s, approximately 60% of the surface slick evaporates after 5 days, while a further ~18% is dispersed into the water column and the surface slick makes up the remaining ~22%. High wind speeds of 10 m/s are predicted to rapidly (after 48 hours) disperse (45%) and evaporate (55%) the oil with no surface slick remaining.

Vale 2013 has a high tendency for emulsion formation, with peak water contents in the surface slick stabilising at 76% after 72 hours for low winds (1 m/s), while this occurs much more rapidly (within 6–12 hours) under moderate (5 m/s) and high (10 m/s) wind speeds.

Table A-2: Comparison of whole properties of Mutineer-Exeter Crude and SINTEF Vale 2013 (GHD, 2021)

Hydrocarbon type	Specific gravity	Viscosity at 20 °C (cP)	API	Wax content (%)	Pour point °C	Asphaltene (%)
Mutineer-Exeter	0.8091	3.027	43.4	3	12	0.03
Vale 2013 (Modelling analogue)	0.816	37	42.0	3.26	−9	0.03

Figure A-2 provides the predicted weathering and fates of surface hydrocarbon for the largest sea surface swept area at the moderate threshold. The graph shows that hydrocarbon on the sea surface is expected to evaporate rapidly (GHD, 2021).

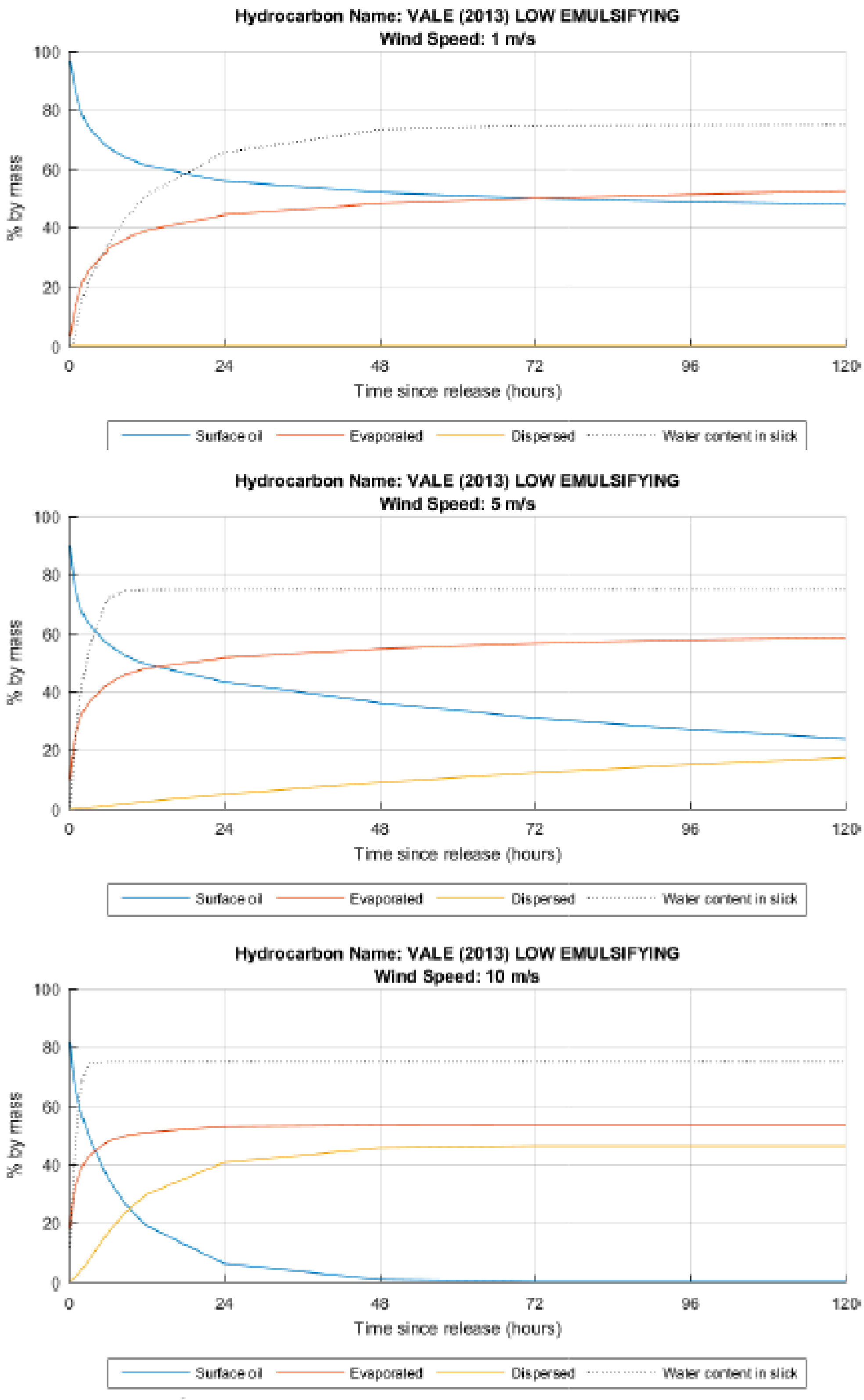


Figure A-2: Simulated weathering of the SINTEF Vale 2013 hydrocarbon for constant wind speeds of 1 m/s (top), 5 m/s (middle), and 10 m/s (bottom) (GHD, 2021)

Appendix B: ALARP Assessment Framework

1. Rationale

As part regulatory approval requirements for petroleum activities, the Environment Plan (EP) and/or Oil Pollution Emergency Plan (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.

2. Guidance documents

Guidance documents used in the preparation of this framework include:

+ Oil Spill Risk Assessment and Response Planning Procedure QE-91-II-20003;
+ NOPSEMA Guidance Note ALARP N-04300-GN0166 Revision 6 June 2015;
+ NOPSEMA Guidance Note Control Measures and Performance Standards N04300-GN0271 Revision No 4 Last Reviewed 2020;
+ NOPSEMA Guideline Environment Plan Decision Making N-04750-GL1721 Revision 6 – November 2019;
+ NOPSEMA Guidance Note Risk Assessment GN0165 Revision 5 May 2017; and
+ NOPSEMA Oil Pollution Risk Management GN1488 Rev 2 February 2018.

3. 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.**

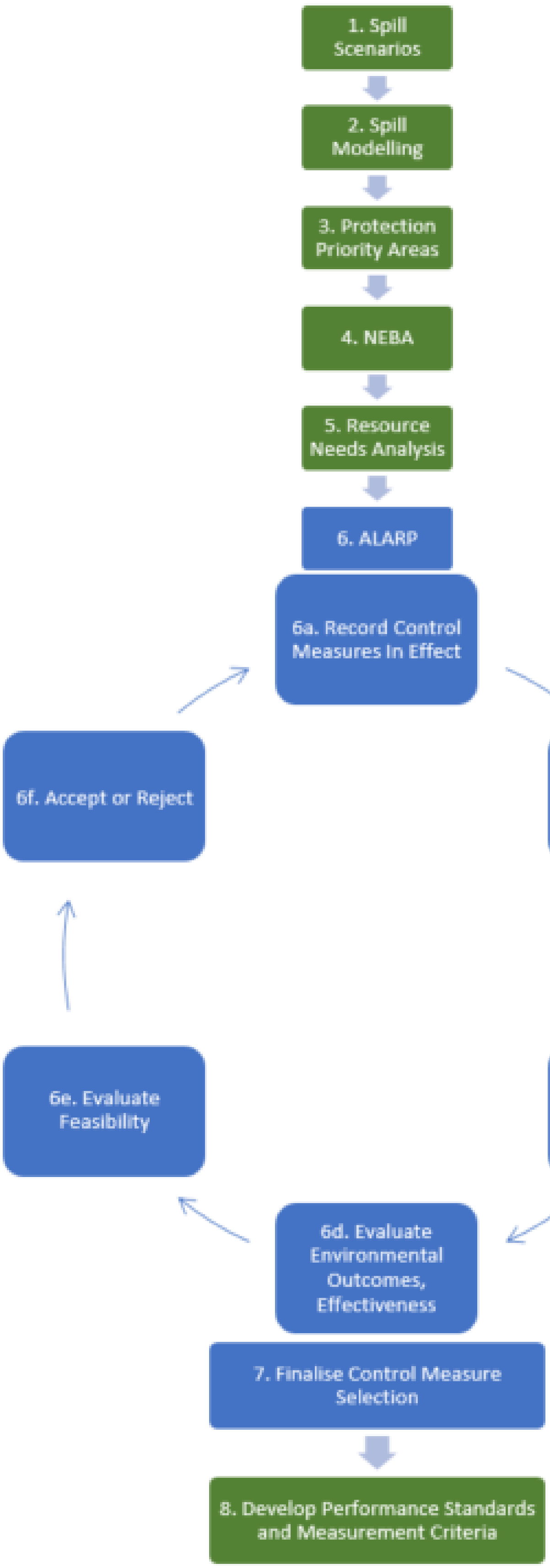


Figure B-1: ALARP Assessment Framework

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 are locations of high ecological value within the EMBA that would be targeted in response. Selection of Protection Priority Areas is detailed in the Oil Spill Risk Assessment and Response Planning Procedure QE-91-II-20003
4. NEBA: Net Environmental Benefit Analysis (NEBA) is used to select the most effective response strategies to protect the Protection Priority Areas 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. An 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**.

- 6a) Record Control Measures In Effect: The spill response control measures currently in place for Santos Offshore 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.
- 6b) 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.
- 6c) 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.
- 6d) Evaluate Environmental Outcomes, Effectiveness: The environmental outcomes and effectiveness are assessed for all control measures identified and described through Steps 6a, b, and c.
- 6e) Evaluate Feasibility: Time, cost and effort required for implementation are assessed for all control measures identified and described through Steps 6a, b, and c.
- 6f) 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 current Santos 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.

4. 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 Revision 6 – November 2019
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.

Column	Description
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. <u>Functionality</u> 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? <u>Availability</u> Probability that the control measure will be available when required and has not failed or is undergoing a maintenance or repair. <u>Reliability</u> 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. <u>Survivability</u> 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. <u>Dependency</u> 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 failure of others, then the control measures are not independent, and it may not be appropriate to count such measures as separate. <u>Several control measures are reliant on equipment, people and vessels, hence have high dependence.</u> <u>Compatibility</u> 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 Last Reviewed 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

5. 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. Potential Control Measures were identified and assessed by the Santos WA 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 relief well drilling within 77 days (from time of notification) can be implemented using MODUs, equipment and specialist personnel that Santos has arrangements to gain access to. Three potential additional Control Measures were identified and assessed. One additional Control Measure was accepted as reasonably practicable. Accepted Control Measure was: + Relief well drilling supplies are readily available in WA. Two Control Measures were rejected as grossly disproportionate. Rejected response strategies were: + Contract source control personnel through a provider in addition to existing arrangements + Wild Well Control personnel on standby in Perth during drilling operations in order to respond immediately to a LOWC 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.
ALARP assessment summary – monitor and evaluate
Various, independent inputs from multiple service providers are used to build a detailed Common Operating Picture in the incident. Seven additional potential Control Measures were identified and assessed. Three additional Control Measures were accepted as reasonably practicable. The accepted measures were: + 2 tracking buoys available in Dampier during the activity + Required vessel specifications included in Vessel Tracking System + Maintain a list of providers that could assist with fauna aerial observations. Four Control Measures were rejected as grossly disproportionate. Rejected Control Measures were: + Purchase of oil spill modelling system and internal personnel trained to use system + Trained aerial observers based in in strategic locations such as Karratha + Ensure trained marine mammal/fauna observers based in Dampier + Trained water monitoring specialists available in Dampier

Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in **Table 10-39**. 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, satellite imagery providers, water quality monitoring providers, and spill responders. Additional key areas for effectiveness during preparedness are following relevant procedures such as the Protected Marine Fauna Interaction and Sighting Procedure and limiting environmental impacts from response activity through personnel and vehicle management. During response, a key area for ensuring effectiveness is the mobilisation of requirements in order to commence monitor and evaluate operations. These key areas of effectiveness have been represented in Performance Standards for monitor and evaluate operations.

ALARP assessment summary – mechanical dispersion

Mechanical dispersion is a secondary strategy that could be undertaken by vessels undertaking primary response strategies without the requirement for additional equipment, and no areas of improvement were identified. The use of mechanical dispersion in a response would be assessed as part of an operational NEBA.

No potential additional 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 are around the development of an operational NEBA to confirm suitability and environmental benefit, and the mobilisation of vessels. These key areas of effectiveness are reflected in the performance standards.

ALARP assessment summary – shoreline protection and deflection

Large quantities of various types of nearshore booms and skimmers from Exmouth, Dampier and Fremantle ensures that equipment is in place to implement this response strategy within 24 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 from Perth. These regional and state resources ensure that equipment and personnel are not a limiting factor in this response strategy. An area of improvement is availability of shallow draft vessel. A review of Control Measures associated with vessels identified that improvement could be made by adding a provision for shallow draft boom tow vessels in existing Master Service Agreements with vessel providers.

Four additional potential Control Measures were identified and assessed.

One Control Measure was accepted as reasonably practicable. The accepted control measure was:

+ Provision for shallow draft boom tow vessels added to Master Service Agreement

Three Control Measures were rejected as grossly disproportionate. Rejected response strategies were:

+ 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 are based at strategic locations such as Port Hedland, Broome, Karratha or Exmouth

Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in **Table 12-5**. 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.
ALARP assessment summary – shoreline clean-up
Regional and Fremantle stockpiles and locally available supplies provide a range of shoreline clean-up equipment 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, followed by AMOSC staff and AMOSC Core Group from Perth. Equipment and trained personnel are not expected to be limiting factors for this response strategy. Shoreline contact times are >10 days and clean-up activities would be able to be met by resources obtained via AMOSC Core Group personnel and mutual aid (if required). The availability of shallow draft vessels was identified as an area of improvement. A review of control measures associated with vessels identified that improvements could be made by adding a provision for shallow draft vessels in existing Master Service Agreements with vessel providers. Nine additional potential Control Measures were identified and assessed. One Control Measure was accepted as reasonably practicable. The accepted control measure was: + Provision for shallow draft vessels added to Master Service Agreement Eight Control Measures were rejected as grossly disproportionate. Rejected response strategies were: + Mechanical mobile plant equipment for clean-up pre purchased and positioned in Dampier + Prepurchase and storage of equipment (decontamination/ staging equipment, clean-up and flushing, PPE) at Dampier + Access to additional shallow draft vessels owned by Santos to transport personnel to key sensitive areas on offshore islands + Access to additional team leaders that are locally based at 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 (Dampier) labour hire companies or emergency response organisations + Faster access to clean-up personnel via Santos employment of local personnel + Review of shoreline sensitivity mapping. Review of Tactical Response Plans (TRPs) and development of additional TRPs for key locations Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in **Table 13-5.** 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.
ALARP assessment summary – oiled wildlife
The worst-case scenario associated with this OPEP results in minimal shoreline contact and consequently only low numbers of oiled wildlife are anticipated. Santos has developed a Santos Wildlife Framework Plan as a Control Measure to ensure that a procedure is in place for OWR, where they are the Control Agency or Support Organisation, in order to provide an effective and coordinated OWR. Santos has access to the indicative resource requirements for the worst-case scenario in this OPEP as per the WA Oiled Wildlife Response Plan. Including mobilisation of AMOSC oiled wildlife equipment and industry OWR team to a forward staging area within 48 hours. AMSA also maintains an oiled wildlife washing container in Dampier. The availability of trained personnel in the initial stages of an incident is a limiting factor for this response strategy. 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. Three potential Control Measures were identified and assessed. All were rejected as grossly disproportionate. Rejected response strategies were: + Additional Santos OWR trained personnel positioned in Dampier + 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 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, the mobilisation of requirements for initial oiled wildlife response operations and the management of the oiled wildlife response in accordance with the WA Oiled Wildlife Response Plan are both key elements for achieving this strategy and they are represented as Performance Standards.
ALARP assessment summary – waste
The Santos contract with the waste service provider has provisions for waste management operations for the worst-case scenario detailed in **Table 6-4**. Further detail is captured in the Waste Management Plan – Oil Spill Response Support (QE-91-IF-10053). The waste service provider can mobilise waste receptacles to Dampier within 12–24 hrs. Given the waste service provider arrangements and preplanning already undertaken, waste storage facilities, road transport and logistics are not expected to be limiting factors in the response. For these components, potential Control Measures were identified and evaluated but were found to either make no improvement in capability or cost was grossly disproportionate. An area of improvement is the availability of vessels required for waste transport at sea. No potential Control Measures to address this area of improvement were identified and accepted. Two potential Control Measures were rejected as grossly disproportionate. Rejected Control Measures were: + Maintain contracts with multiple service 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 15-5**. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around 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.

ALARP assessment summary – scientific monitoring

Oil spill scientific monitoring will be conducted on behalf of Santos by a contracted monitoring service provider as detailed in the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162) and the relevant Scientific Monitoring Programs. An area of improvement is the availability of vessels in the initial stages of response. To address this area of improvement, a potential Control Measure around more detailed vessel tracking was assessed and accepted. One Control Measure, having trained scientific monitoring personnel and equipment on standby in Dampier was considered disproportionate. Another potential Control Measure relating to maintaining equipment and lists of monitoring providers was adopted.

Three additional potential Control Measures were identified and assessed.

Three additional Control Measures were accepted as reasonably practicable. The accepted Control Measures were:

- Maintain equipment list and list of suppliers for implementation of Scientific Monitoring Plans
- Determine required vessel specifications required for scientific monitoring implementation and improve accuracy of Vessel Tracking System.

One Control Measure was rejected as grossly disproportionate. The rejected Control Measure was:

- Scientific monitoring personnel and equipment on standby in Dampier

Performance Standards and Measurement criteria that have been developed for the in effect and accepted Control Measures are shown in **Table 16-4**. 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 monitoring service provider capability and reviews of existing baseline data. During response, a key area for effectiveness is the mobilisation of requirements to commence scientific monitoring and ensuring that relevant approved manuals and plans are followed. These key areas of effectiveness are reflected in the Performance Standards.

Appendix C: Pollution report

Department of **Transport**

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

Marine Pollution Report (POLREP)

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
Fax: 1300 905 866

INCIDENT DETAILS

Date of Incident:____________ Time of Incident *(24 hr format)*: ____________

Location name/description: ____________

Incident Coordinates Latitude of spill____________ Longitude of spill ____________

Format of coordinates used *(select one)* ☐ *Degrees & decimal degrees* ☐ *Degrees, minutes & decimal minutes* ☐ *Degrees, minutes & seconds*

Description of Incident: ____________

POLLUTION SOURCE

☐ 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, if known ***(litres):*** ____________

Has the discharge stopped? ☐ Yes ☐ No ☐ Unknown

Weather conditions at site: ____________

☐ **Photos taken** Details:____________ held by: ____________

☐ **Video taken** Details:____________ held by: ____________

☐ **Samples taken** Description:____________ held by: ____________

☐ **Items retrieved** Description:____________ held by: ____________

ADDITIONAL INFORMATION

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

Equipment used? ☐ AMSA ☐ State / NT ☐ Industry

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

ORIGINAL REPORT SOURCE

Name:__________ Position:__________ Phone: __________

Combat agency:__________ Statutory agency: __________

SENDER DETAILS

Name:__________ Agency:__________ Date:__________

Phone: __________ Fax: __________ Email:__________

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 WestPlan - Marine Oil Pollution. 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.

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

Department of
Transport

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

Marine Pollution Situation Report (SITREP)

Send completed form to:
Maritime Environmental Emergency Response
Department of Transport
GPO Box C102 PERTH, WA 6839
Email: marine.pollution@transport.wa.gov.au
and rccaus@amsa.gov.au
Fax: 1300 905 866

MARINE POLLUTION 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 Name:______________________________ **Ref. No.** __________________

Priority ☐ Urgent ☐ Immediate ☐ Standard

Final SITREP? ☐ Yes ☐ No Next SITREP on: ________________

Date:____________________ **Time:**________________

POLREP 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:

<table>
<tr><td rowspan="7">SITREP
Prepared By</td><td colspan="2">Name:</td></tr>
<tr><td colspan="2">Agency:</td></tr>
<tr><td colspan="2">Role:</td></tr>
<tr><td rowspan="3">Contact</td><td>Telephone</td></tr>
<tr><td>Fax</td></tr>
<tr><td>Mobile</td></tr>
<tr><td colspan="2">No of Pages Attached:</td></tr>
</table>

To post the form please click on the
“POST” button below

POST

RESET

MEP_Sitrep_1114

Appendix E: Vessel surveillance observer log

Santos

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

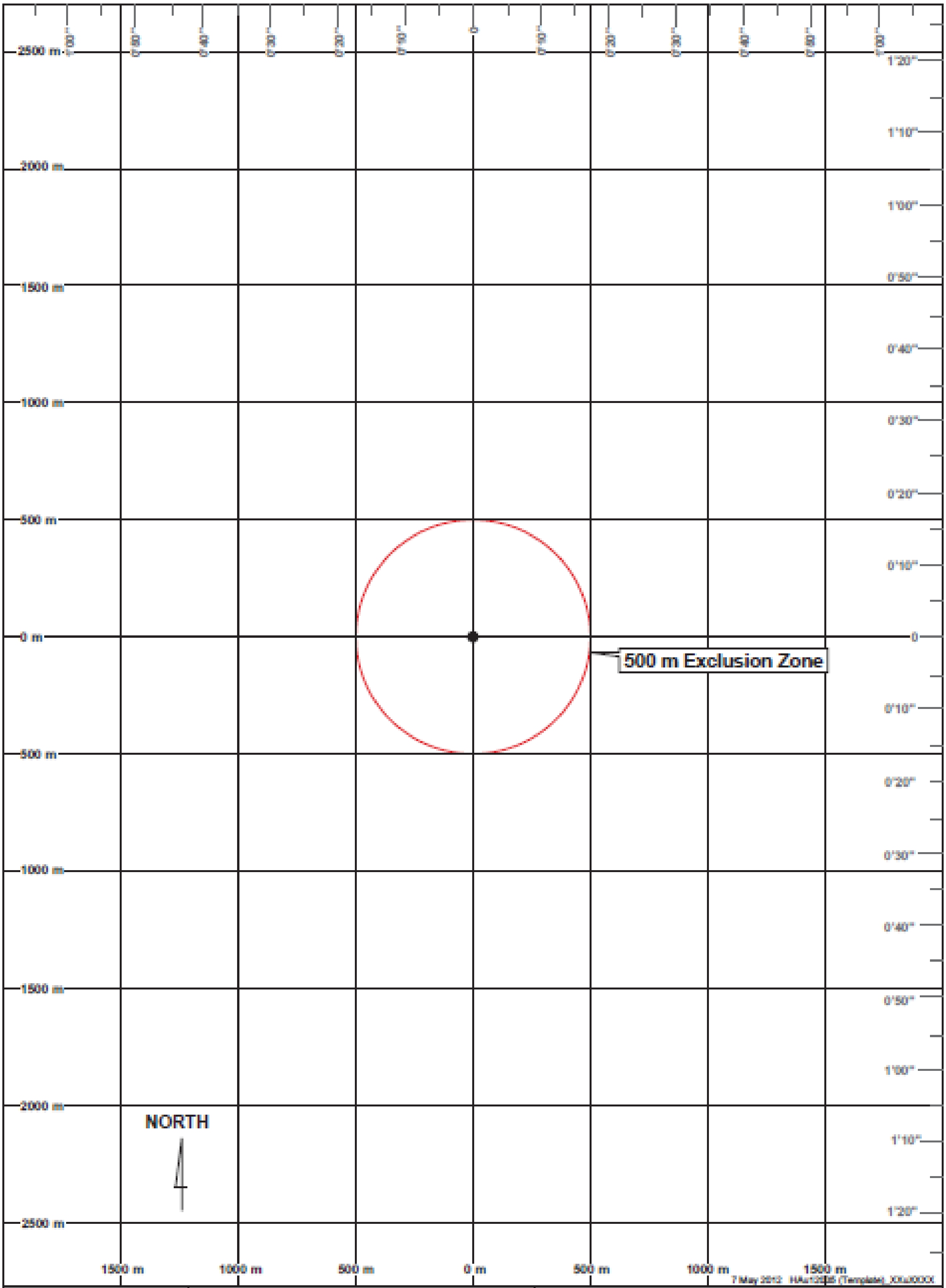
Survey Details				
Date:	Start time:	End Time:	Observer/s:	
Incident:			Area of Survey:	
Aircraft type:	Call sign:		Average Altitude:	Remote sensing used:
Weather Conditions				
Wind speed (knots)		Wind direction		
Cloud base (feet)		Visibility		
Time high water		Current direction		
Time low water		Current 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

○ Bottlenose dolphin

○ Spinner dolphin

○ Dolphin species unknown

○ Whale shark

○ Dugong

○ Hawksbill turtle

○ Loggerhead turtle

○ Green turtle

○ Flatback turtle

○ 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					

Santos

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

Santos

Aerial Surveillance Reconnaissance Log – Oil Spill

<table>
<tr><td colspan="6">Survey Details</td></tr>
<tr><td>Incident:</td><td>Date:</td><td>Start time:</td><td>End Time:</td><td colspan="2">Observer/s:</td></tr>
<tr><td colspan="6">Area of Survey</td></tr>
<tr><td colspan="3">Start GPS
LATITUDE:

LONGITUDE:</td><td colspan="3">End GPS
LATITUDE:

LONGITUDE:</td></tr>
<tr><td>Aircraft type</td><td colspan="2">Call sign</td><td colspan="2">Average Altitude</td><td>Remote sensing used (if any)</td></tr>
<tr><td colspan="6">Weather Conditions</td></tr>
<tr><td colspan="2">Sun/Cloud/Rain/Windy</td><td colspan="2">Visibility</td><td colspan="2">Tide Height
L/M/H</td></tr>
<tr><td colspan="2">Time high water</td><td colspan="2">Time low water</td><td colspan="2">Other</td></tr>
<tr><td colspan="6">Shoreline Type - Select only ONE primary (P) and ANY secondary (S) types present</td></tr>
<tr><td></td><td>Rocky Cliffs</td><td></td><td>Boulder and cobble beaches</td><td></td><td>Sheltered tidal flats</td></tr>
<tr><td></td><td>Exposed artificial structures</td><td></td><td>Riprap</td><td></td><td>Mixed sand and gravel beaches</td></tr>
<tr><td></td><td>Inter-tidal platforms</td><td></td><td>Exposed tidal flats</td><td></td><td>Fine-Medium sand grained beaches</td></tr>
<tr><td></td><td>Mangroves</td><td></td><td>Sheltered rocky shores</td><td rowspan="2"></td><td rowspan="2">Other</td></tr>
<tr><td></td><td>Wetlands</td><td></td><td>Sheltered artificial structures</td></tr>
<tr><td colspan="6">Operational Features (tick appropriate box)</td></tr>
<tr><td></td><td>Direct backshore access</td><td></td><td>Alongshore access</td><td></td><td>Suitable backshore staging</td></tr>
<tr><td colspan="6">Other</td></tr>
</table>

Appendix J: Shoreline Clean-up Equipment

Equipment List for an Initial deployment of a 6 person Manual Clean Up Team

On Shore Clean-up Tools		**Quantity**
	Disposal Bag Labelled, 140 cm x50cm x 100um	1000
	Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100um	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	1000
	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 (assort 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
	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	
Optional Items		

	Inflatable Tent 9 square metres	1

Equipment list for a decontamination unit for Beach 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	
	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 100um	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
Optional 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	

Equipment list for deployment of a 6-person team for flushing or recovery

Flushing Equipment		**Quantity**
	Diesel self prime semi trash pump, 25-35 psi, 4.8hp	1
	Perforated 2” lay flat hose, 20 mtr 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
	Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section	2 (50m)
	Towing Bridle	2
	Danforth Sand Anchor Kit, 30m lines, 15m trip lines	3
	Diesel Powered pump with hose	1
	Manta Ray skimmer	1
Personal Protection Equipment (PPE) Team of 6		
	Spill Crew Hazguard water resistant coveralls (assort sizes)	36
	Respirator dust/mist/fume and valve	40
	Disposable box light nitrile gloves (100bx)	2
	Ear Plugs (200bx)	1
	Safety Glasses	18
	Gum Boots (assort size)	18
	Hyflex Oil Restraint Gloves (assort size)	18
	Day/Night Vest	6
Storage Equipment		
	Collapsible Bund 1.6m x1.2m	1
	Misc sizes of ground sheets/tarps	6
	Collapsible Tank 5000 litres	2
Absorbents		
	Absorbent Boom ‘oil and fuel only’ 3 or 6m x 180mm	200mtrs
	Absorbent Roll ‘oil and fuel only’ 40m x 9m	10
	Absorbent Pad “oil and fuel only” 45cm x 45cm	1000
	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

Equipment list for a 6 person team for near shore clean up

Absorbents		
	Absorbent Roll ‘oil and fuel only’ 40m x 9m	20
	Absorbent Pad “oil and fuel only” 45cm x 45cm	2000
	Absorbent Boom “oil and fuel only” 3or6m z 180mm	200mtrs
	Poly Mops (snags)	150
	Poly Absorbent Wipes	20
Recovery Equipment		
	Tidal Boom (shoreline boom) 25m lengths	4 (100m)
	Tidal Boom Accessories pack	2
	Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section	8 (200m)
	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		**Quantity**
	Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100um	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 Protection Equipment (PPE) Team of 6		
	Spill Crew Hazguard water resistant coveralls (assort sizes)	36
	Disposable box light nitrile gloves (100bx)	2
	Alpha Tec gloves (assort size)	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 1.6m x 1.2m	2
	Collapsible bund 4m x 2.4m	1
	Collapsible Tank 5000 litres	2
	Alum box, Bin & lid Storage/transport cases	10
	Misc sizes of ground sheets/tarps	6
Optional Items		
	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

Appendix K: Shoreline Response Strategy Guidance

Shoreline Response Strategy Guidelines

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.

Sensitive Receptors	Strategy Guidance
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 (Note: submerged coral reef communities are less susceptible to oiling)	- 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. - 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.

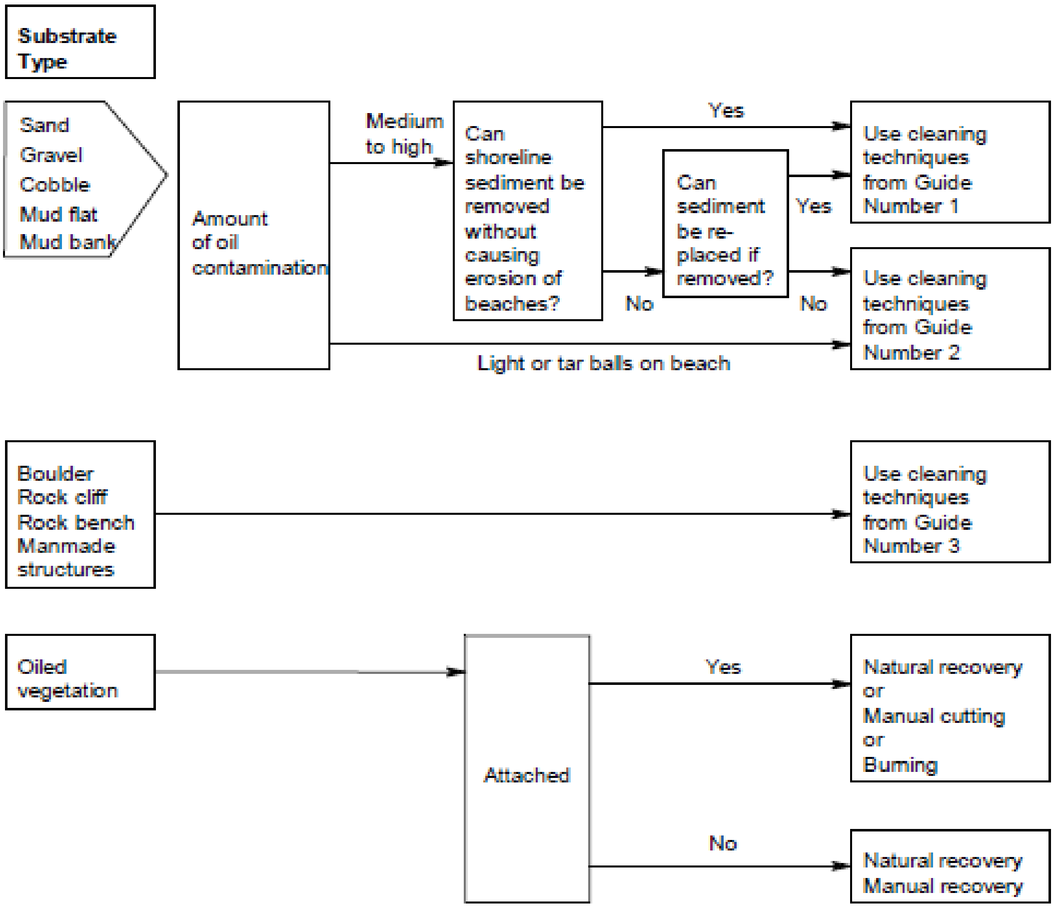


Figure K-1: Shoreline Clean-up Master Decision Guide

Shoreline Cleanup Decision Guide Number 1

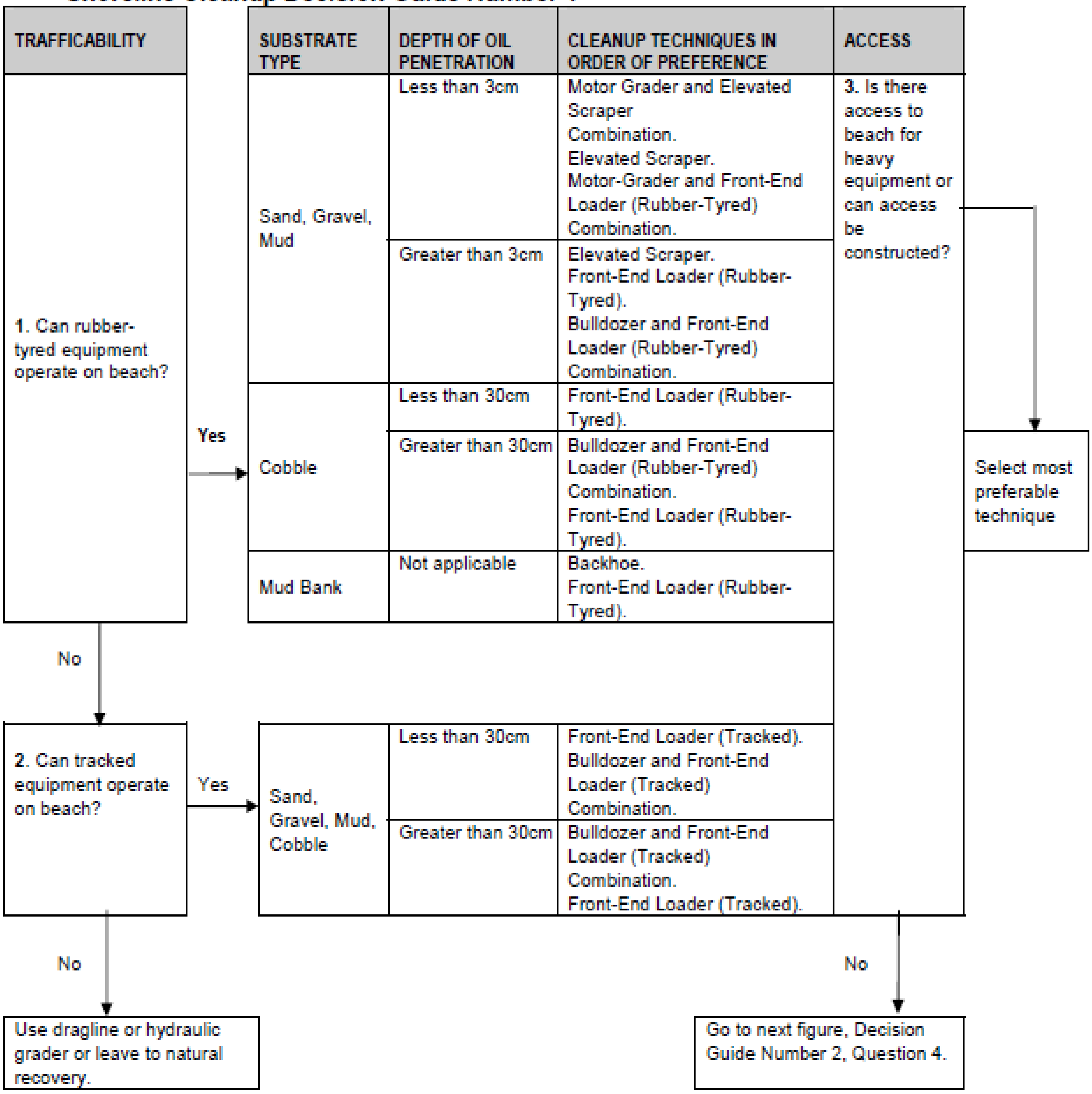


Figure K-2: Shoreline Clean-Up Decision Guide 1

Shoreline Cleanup Decision Guide Number 2

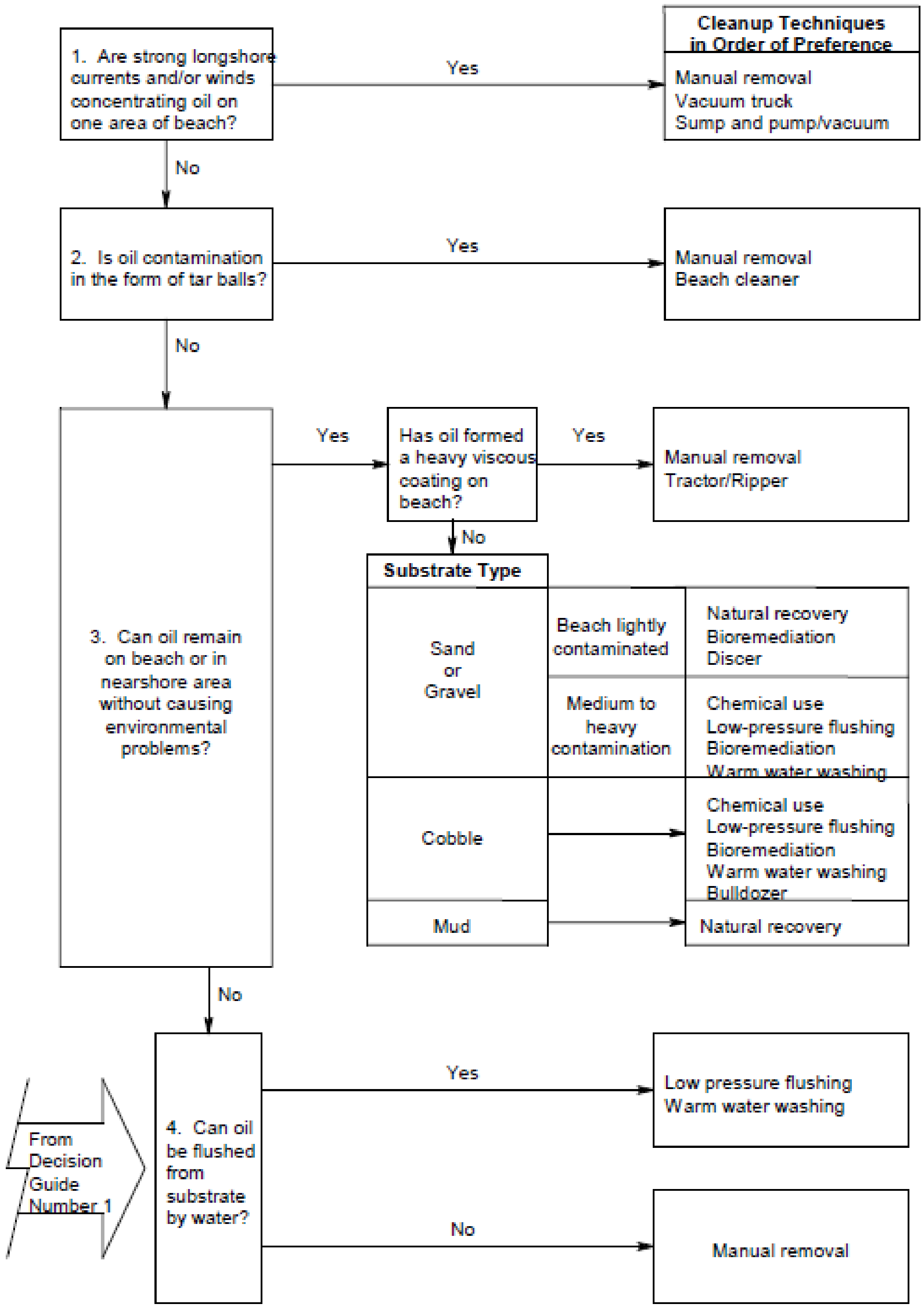


Figure K-3: Shoreline Clean-Up Decision Guide 2

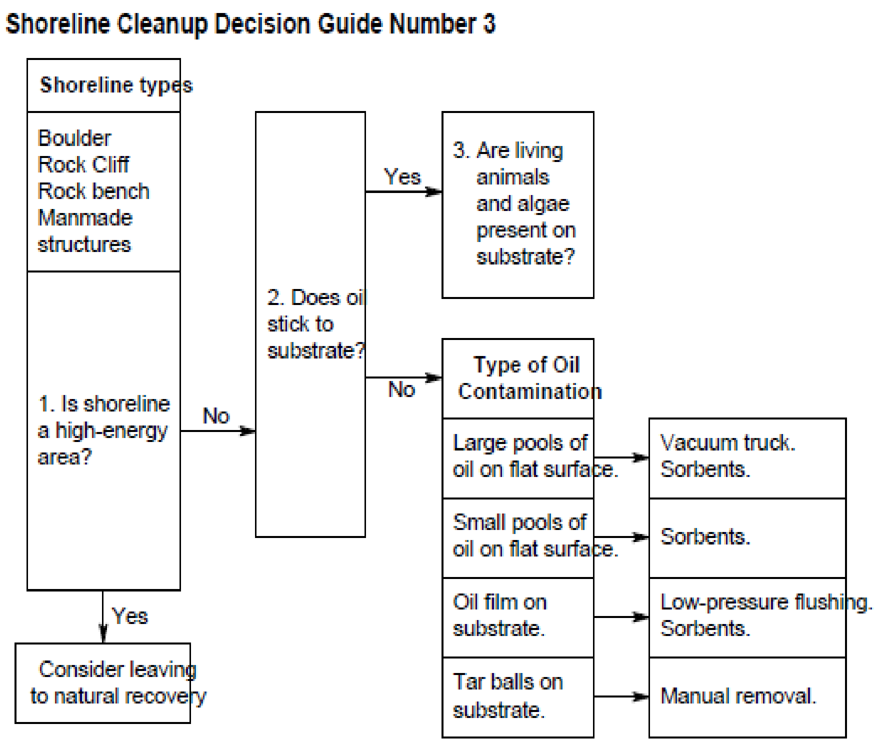


Figure K-4: Shoreline Clean-Up decision Guide 3

Appendix L: Operational Guidelines for Shoreline Response

Operational Guidelines for Shoreline Clean-up activities

1.1.1 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	✓ Bins, barrels, skips, tanks
✓ Barrier tape and stakes	✓ Hot and cold beverages Welfare)
✓ Signposting equipment	✓ 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:
  - o Staging areas
  - o Pits if necessary
  - o Platform within earth berms
  - o 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.

1.1.2 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:
  - o Collection/scraping/gathering
  - o Placing in bags/waste containers
  - o 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.

1.1.3 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:
  - o (case 1) fluid oil: radial or converging scraping towards a collection point on the foreshore; removal by pumping
  - o (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

1.1.5 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. Landing craft vessels are supplied through Quadrant Energy existing vessel suppliers.

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 (refer below) 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 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-high tide mark; and

(4) Deployment of the waste pickup barges to retrieve collected wastes from the temporary bunding and to complete the shoreline clean-up and final polishing.

Appendix M: 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 WAOWRP. An overview of sources of personnel is provided in Table 1 and an overview of ‘first-strike’ equipment for initial deployment is provided in Table 2.

In the event of large-scale OWR, further specialised OWR equipment and personnel will be provided by in-country and international organisations, as necessary, accessed through AMOSC (primary) and OSRL (secondary). Equipment and personnel required for the development and operation of staging areas/ treatment facilities can be provided locally (for example veterinary personnel and supplies). The East Kimberley regional operational OWR plan and the West Kimberley regional operational OWR plan (as per the WAOWRP) provide detail of local organisations and suppliers for personnel and equipment.

In addition to OWR providers mobilised through AMOSC and OSRL/Sea Alarm, Santos maintains access to the workforce marketplace during an emergency response. Level 1 oiled wildlife responders, of which the WAOWRP indicates 90+ could be required for a Level 6+ event, could be provided through Santos workforce hire arrangements. On the job training requirements for Level 1 responders could be provided by DBCA, AMOSC or Sea Alarm personnel. Skilled but ubiquitous roles required for manning and maintaining facilities and staging areas, such as trades, technicians and vets, could also be filled through workforce hire arrangements. The East Kimberley regional operational OWR plan and the West Kimberley regional operational OWR plan (as per the WAOWRP) provide contact details for local trade personnel, vets and wildlife specialists that could be employed for manning/maintenance of forward response wildlife response facilities.

Table 1: Sources of Oiled Wildlife Response Personnel

<table>
<tr><th colspan="2">AMOSC / INDUSTRY RESPONDERS</th><th>Activated through</th><th>Capability</th></tr>
<tr><td colspan="2">AMOSC Technical Advisor – Oiled Wildlife – assistant in IMT (as industry OWA if required)</td><td rowspan="3">AMOSC Duty Officer</td><td>1*</td></tr>
<tr><td colspan="2">AMOSC OWR Industry Team– Level 2-4 responders (DBCA training)</td><td>18*</td></tr>
<tr><td colspan="2">WA Petroleum industry personnel – Trained by individual petroleum industry companies – activated via mutual aid</td><td>~50*</td></tr>
<tr><th colspan="2">AUSTRALIAN OWR EXPERTISE</th><th>Activated through</th><th>Capability</th></tr>
<tr><td colspan="2">Blue Planet Marine (ACT and WA) – Oiled Wildlife Responders</td><td rowspan="3">AMOSC Duty Officer</td><td>10-20*</td></tr>
<tr><td colspan="2">Phillip Island National Parks(VIC) – Oiled Wildlife Responders</td><td>~70 staff
~45 volunteers*</td></tr>
<tr><td colspan="2">NatPlan Mutual Aid</td><td>50-100*</td></tr>
<tr><td>Perth Zoo – Duty Veterinarian</td><td>Wildlife care and rehabilitation advice, expertise and management</td><td colspan="2">Personnel potentially available to petroleum industry (currently there is no formal arrangement)</td></tr>
</table>

	Links to wildlife rehabilitation networks	
OWA	DBCA State Duty Officer	1 per shift
Personnel		
DBCA staff with wildlife and emergency management skill set who currently operate in fire preparedness and response		
INTERNATIONAL OWR EXPERTISE	Activated through	Capability
DwyerTECH NZ – Facilities Management Personnel (call-off contract)	AMOSC Duty Officer	2*
Wild base, Massey University (NZ) - Oiled Wildlife Responders		4-6*
International Bird Rescue (USA)- Oiled Wildlife Responders		4*
Sea Alarm (Belgium) – Expert assistance with organisational set-up and global OWR resourcing	OSRL Duty Officer	2/3** (Sea Alarm) + additional OWR responders accessed through global network

* As per AMOSC Capacity Statement 25 Jun 2020
** As per Sea Alarm/OSRL Service Level Agreement Statement

Table 2: First Strike Deployment-Ready OWR Equipment

AMOSC OWR Equipment*	Activated through	Location
1 x AMOSC owned OWR container 1 x AMOSC owned box kit 1 x Fauna Hazing and Exclusion kit	AMOSC Duty Officer	Fremantle
1 x AMOSC owned OWR container 1 x AMOSC owned box kit 1 x Fauna Hazing and Exclusion kit		Geelong
1 x AMOSC owned box kit		Exmouth
1 x AMOSC owned box kit		Broome
National Plan (NatPlan) OWR Equipment*	Activated through	Location
1 x NatPlan OWR container	AMSA RCC	Dampier

1 x NatPlan/DBCA Box/trailer kit		
1 x NatPlan OWR container		Darwin
1 x NatPlan OWR container		Townsville
1 x NatPlan OWR container		Devonport
WA DBCA OWR Equipment*	Activated through	Location
1 x DoT OWR container	DoT Duty Officer	Fremantle
DBCA OWR trailer kit		Karratha
DBCA OWR trailer kit		Kensington
NSW Maritime OWR Equipment*	Activated through	Location
1 x NSW Maritime OWR container	AMSA RCC	Sydney
OSRL OWR Equipment**	Activated through	Location
1 x Search and rescue response package 1 x Search and rescue medical response package 2 x Cleaning and rehabilitation response package 1 x Cleaning and rehabilitation medical package	OSRL Duty Officer	UK
1 x Cleaning and rehabilitation response package		Singapore
2 x Search and rescue response package 1 x Cleaning and rehabilitation response package		Bahrain
1 x Wildlife Rehabilitation Unit 2 x Cleaning and rehabilitation response package		Fort Lauderdale, USA

* As per AMOSC capacity statement 25 June 2020
** As per OSRL SLA Equipment Report December 2021

Appendix N: Scientific monitoring plans

1 Scientific Monitoring Principles

1.1 Monitoring Design

In the event of an oil spill the monitoring design will depend upon the nature of the spill, the availability of baseline data in relation to the spill extent and expert opinion. In order to ensure the application of robust designs and sampling approaches which have the highest likelihood of detecting an environmental impact while allowing suitable flexibility, this plan provides a set of Guiding Principles for monitoring design and sampling (**Table 1**). A structured decision making framework for allocating monitoring effort in both time and space is described in **Figure 1**.

Table 1: Guiding Principles for Oil Spill Monitoring Design and Methodologies.

Principle	Explanation	Key guiding references
Match baseline	Designs and methodologies should follow those used in appropriate baseline studies wherever possible.	N/A
Comprehensive sampling	Sampling methods should seek to sample the full range of taxa within each assemblage. This may require the use of several complimentary techniques (the exception is if indicator taxa are employed; see below).	N/A
Reliable indicator taxa	If indicator taxa are targeted then the choice of indicator should be defensible, and a link to the response of the broader assemblage demonstrated. Indicators of ecosystem function should also be considered.	Hilty and Merenlender (2000)
Appropriate sample area or volume	Size of sampling unit should be determined based on the level of clustering of individuals and whether the goal is to quantify this clustering, or establish low inter-sample variability (probably more the latter for oil spill studies).	Kenkel et al. (1989)
Reduce within sample variation over time	Wherever possible repeated measures are carried out on the same sample space in order to reduce within treatment variation.	N/A
Compositing of samples	Appropriate compositing to increase statistical power should be considered.	Carey and Keough (2002)
Account for environmental gradients and partition variations	Sources of variation are considered and compartmentalised to best reduce within treatment variation, and thereby maximise power to detect an impact. This is managed through several means:	English et al. (1997), Snedecor and Cochran (1989)

Principle	Explanation	Key guiding references
	Environmental covariates are considered in sampling design recorded and incorporated statistically. A hierarchical or stratified sampling design is used to address variation at multiple scales Design is standardized, by sampling equivalent strata (e.g., level of exposure, depth etc.).	
Assess statistical power	Where null-hypothesis tests are planned, statistical power of the design is assessed prior to execution.	Gerrodette (1987) Legg and Nagy (2006) Toft and Shea (1982)
Appropriate sampling extent	Sample the range of hydrocarbon concentration (and at least the upper end).	Skalski (1995)
Independence amongst samples	Site selection should aim for independence amongst samples and potential spatial or temporal autocorrelation should be considered.	Hurlbert (1984)
Reduce observation error	Observer bias and amongst observer variation should be considered.	Thompson and Mapstone (1997)
Appropriate spatial replication	Sites are replicated. A limitation is that there is only one spill, but control sites should be replicated and spatially Interspersed. Ideally, the design should be able to detect an impact at several possible scales.	Underwood (Underwood 1991, 1992, 1994)
Appropriate temporal replication	Sampling should account for natural temporal variation.	Underwood (Underwood 1991, 1992, 1994)

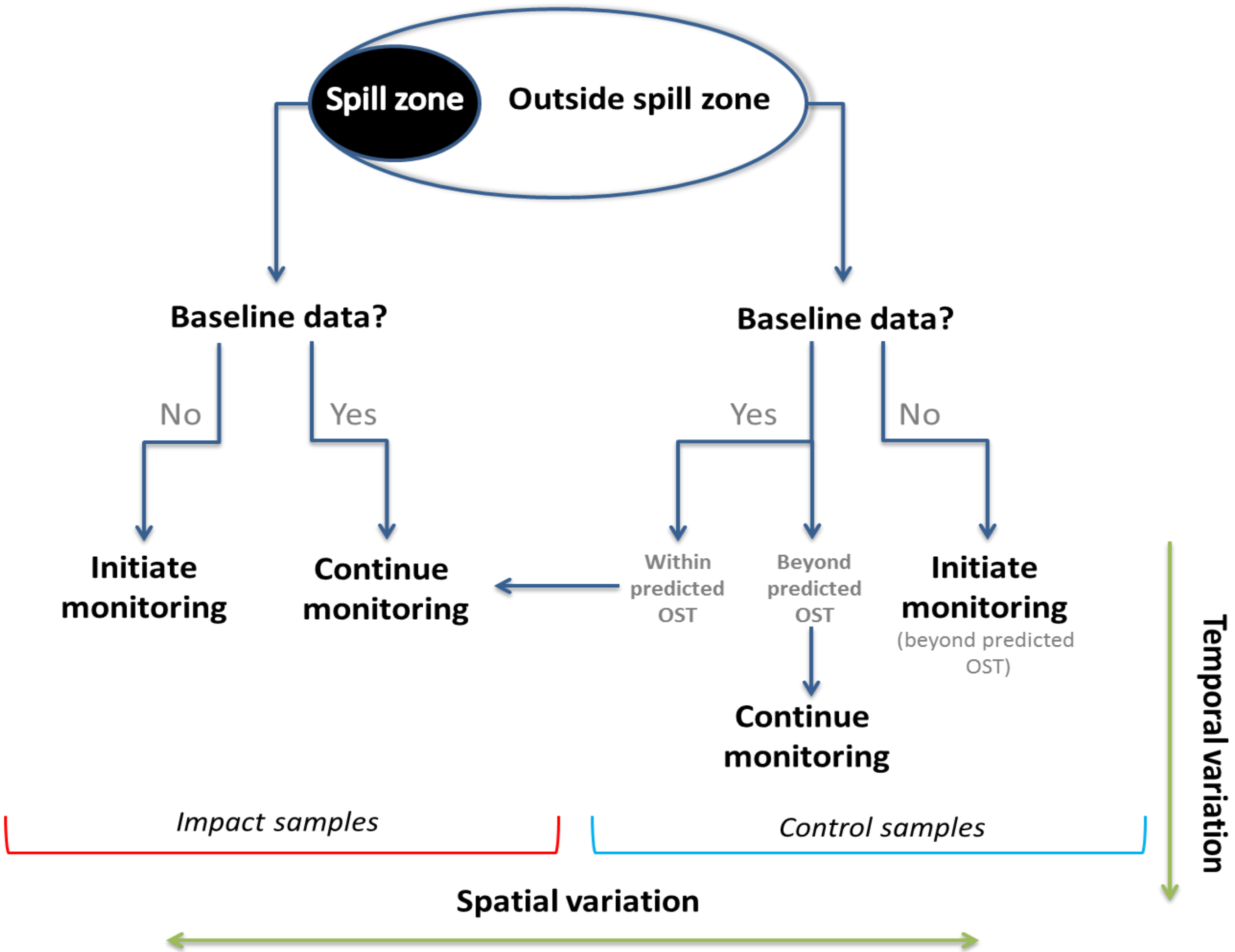


Figure 1: Structured Decision Making Process Based on Gregory et al. (2012) in Reference to Monitoring Programs, the Availability of Baseline Data, and Oil Spill Trajectory. An ideal design sampling would occur across a gradient of exposure rather than 'impact' and 'control' per se.

1.2 Data Analysis

Appendix B details the most important approaches to statistical analysis and related sampling design. These approaches are summarised in Table 2 (below). An important consideration is how this information is best summarised and communicated to guide further decision making and management. **Appendix B** also describes the reporting of environmental outcomes through the use of report card systems and includes a summary of their structure and design.

Table 2: Summary of Data Analysis Techniques.

Analysis type		Description	Strength	Limitations	Addressing limitations
Gradient analysis		Impact is quantified in terms of distance from spill.	Can be established post-spill.	Doesn't account for inherent spatial patterns present prior to spill.	Include spatial covariates in model. Incorporate a temporal component.
Control chart	Univariate	Single variable is monitored and plotted over time, and breaching of control limits tested.	Control sites are not required. Takes account of natural variation in system.	Control limits do not necessarily have biological meaning. Doesn't control for broader spatial scale temporal variation.	Include control charts for control sites which incorporate broad scale temporal variation.
	Multivariate	Multiple variables are combined, monitored and plotted over time, and breaching of control limits tested.	Ability to combine suite of data (e.g. community composition) into one variable. Sites plots not required.	Individual responses are masked. Control limits do not necessarily have biological meaning. Significant control limits challenging to define. Direction of change is undefined.	Compliment with graphical approaches to identify direction of change and individual species responses.
	Reference	Control limits are based on knowledge of biological system (e.g. minimum viable population size, toxicity).	Control limits have recognised biological meaning or consequence.	Control limits may be considered arbitrary.	Use established standards for control limits.

Analysis type	Description	Strength	Limitations	Addressing limitations
BACI	Quantifies state before and after potential impact, and also at impacted and control sites. Impact is tested by statistical interaction of terms.	Controls for natural variation, by incorporating control sites.	Limited power to detect significant impact. Requires appropriate matching of control (non-impacted) sites. Requires pre-impact data.	Increase power by increasing temporal component. Choose indicators with low natural variability.

Santos

2 Scientific Monitoring Plans by Receptor

Table 3 provides a glossary of an SMP as prepared in this report.

Table 3: Glossary of Scientific Monitoring Plans.

SMP Receptor	
Rationale	Importance of receptor, possible impact and importance of monitoring program.
Aim	Description of program aim(s)
Baseline	Refer to **Table 2**, detailed in Baseline Data Review (Astron Environmental Services 2019) (QE-00-BI-20001)
Contact	Contact is defined as occurring where any aerial, visual or florescence observation reports submitted to the Incident Command Team (ICT) show presence or likely presence of oil; or spill fate modelling predicts oil at sensitive receptors of > $1 g/m^2$ for surface oil, and >10 ppb for entrained and dissolved oil. This then activates the relevant SMP, which determines if any impact has occurred based upon applicable thresholds.
Initiation criteria	Initiation criteria, based on data from OMPs.
Termination criteria	Termination criteria based on analysis of Scientific Monitoring data translated to the Incident Management Team (IMT) through the planning function.
Receptor impact	Measured states and pressures according to the State-Pressure-Response model.
Methodological approach	Descriptions of sampling methods in order to carry out scientific monitoring, including reference to methods described in an appendix.
Scope of works	Timeline for scope of works (SoW) development.
Statistically significant	The basis of the significance is determined by the methodological approach as outlined in the relevant SMP.
Resources	List of required resources which may not necessarily be listed within a description of a particular method as described in **Appendix C**.
Implementation	Mobilisation requirements for service provider(s).
Analysis and reporting	Summary of analysis, data management and reporting.

SMP1 – Marine Water Quality	
Rationale	The release of hydrocarbons at sea will pollute marine waters via floating, entrained or dissolved aromatic hydrocarbons. The water quality SMP may also be used in conjunction with OMP1 (Surveillance and Monitoring), to inform the sampling design of other SMPs where objectives are to evaluate impact to and recovery of sensitive receptors, in relation to hydrocarbon contamination.
Aim	To monitor changes in water quality following an oil spill and associated response activities for the purpose of detecting a potential impact and recovery and for informing other scientific monitoring studies.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available metadata will be reviewed for applicable marine water quality baseline data. In the absence of baseline data for hydrocarbons, data from appropriate reference sites will be used in place of the baseline values.
Initiation criteria	Upon notification of a Level 2 or 3 incident (a level 2 or 3 incident includes those which may have an adverse effect on the environment. This may be informed by operational water quality monitoring)
Termination criteria	Concentrations of hydrocarbon contaminants, attributable to the released hydrocarbon, are not significantly higher than baseline data or similar non-impacted sites data. In the absence of baseline or similar non-impact sites data, concentrations of hydrocarbon contaminants, attributable to the released hydrocarbon, are below the relevant hydrocarbon contaminant trigger level within the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018), or the relevant regulatory site-specific trigger level (where these exist), if this is lower and values are not significantly different to reference sites. Forensic fingerprinting of the released hydrocarbon and water quality sample analysis by way of gas chromatography/mass spectrometry (GC/MS) may be used to determine the source of contaminants where this is not otherwise clear from operational monitoring.
Receptor impact	Impacts to specific receptors from hydrocarbons within marine waters are described in individual SMPs.
Methodological approach	Overall sampling design approach will be enacted according to the availability of baseline data guided by the structured decision-making process based on Gregory et al. (2012): 1. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied; 2. If insufficient long-term baseline data is available, where appropriately matched baseline data sites are impacted and non-impacted, a before-after-control-impact (BACI) approach to monitoring will be applied;

SMP1 – Marine Water Quality	
	3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied. See **Appendix B** and **Figure 1** for detailed description of these approaches. The selection of potentially impacted and non-impacted sites will be informed by Operational Monitoring, including operational water quality monitoring and spill trajectory modelling. Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design. <u>Water profiles</u> SMP1 – Marine Water Quality A water quality probe will be used to measure conductivity (to derive salinity in PSU), temperature and depth (CTD), dissolved oxygen (% and mg/L), turbidity (FNU or NTU), and fluorometry along a depth profile. Sampling methods will be aligned with the recommended standard operating procedures for the use of sensors for oil spill monitoring found in Appendix F of the Oil Spill Monitoring Handbook (Hook et al. 2016). <u>Water quality</u> Water quality samples will be taken along a similar depth profile as the CTD measures using a Niskin bottle, Van Dorn water sampler, rosette sampler or equivalent instrument. The laboratory(ies) will inform and supply the appropriate sample containers, storage requirements, holding times, detection limits/limit of reporting for required analytes and the analysis required for each sample. Water samples shall be analysed for key contaminants of concern including polycyclic aromatic hydrocarbons (PAHs), monocyclic aromatic hydrocarbons (including benzene, toluene, ethylbenzene, xylene), and nutrients, metals and chlorophyll-a. At each site, replicate water samples (at least three samples) will be collected to allow appropriate statistical analyses to be made including samples for quality assurance and quality control (QA/QC) purposes (i.e. split sample, triplicate sample, field blanks, transport blanks). Water sample collection and handling will align with Standard operating procedures found in the Oil Spill Monitoring Handbook (Hook et al., 2016), specifically the following sections: + Appendix A & B hydrocarbon analysis; + Appendix C Volatile Organic Compounds Analysis; and + Appendix D Surface Oil Analysis. Environmental DNA (eDNA) will also be collected to detect for the presence of marine species in the water column. Water samples will be collected in Nalgene bottles and sent to an appropriate laboratory for analysis. Sample processing will depend on holding times required (<8 hours ideal) and may involve filtering and freezing of each sample (Grochowsi and Stat 2017).

SMP1 – Marine Water Quality	
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP having been activated.
Resources	+ Marine scientist with experience in water quality sampling + Geographic Information Systems (GIS) personnel + National Association of Testing Authorities (NATA) accredited laboratories for water sample analysis + Vessel and tender in operation + Refuelling facilities + Sample containers and preservative + Sampling equipment + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the SoW following approval by Santos (this time allows for costing, preparation of equipment and disposables and travel time to site).
Analysis and reporting	Chemical analysis will be carried out by NATA-accredited laboratories. A government endorsed laboratory for forensic fingerprinting (GS/MS) will be used. Data will be entered to spatially explicit database. Data will be analysed appropriately in order to determine if there was a statistical difference in water quality before and after a hydrocarbon impact. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP2 – Sediment Quality	
Rationale	Hydrocarbons released during a spill scenario may contact, settle and/or accumulate in marine sediments. Toxic substances found in accumulated hydrocarbons may lead to impacts to ecosystem processes associated with this primary producer habitat. Sediments and marine infauna will be sampled concurrently in order to establish potential correlations amongst the two parameters.
Aim	To monitor the fate and persistence of hydrocarbons in marine sediments following an oil spill and associated response activities. To monitor marine benthic infauna assemblages as an indicator of sediment quality, in relation to an oil spill and associated response activities.

SMP2 – Sediment Quality	
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available databases will be reviewed for applicable marine baseline sediment quality and infauna data. In the absence of baseline sediment quality data, hydrocarbon contaminant trigger values for marine sediments as listed in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018) will be used as a proxy for baseline levels. Where other regulatory site-specific trigger levels exist, the lower of these levels and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018) levels will be used as proxy baseline levels.
Initiation criteria	Operational Monitoring or SMP1 indicates that contacted sediment or sediment predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Concentrations of hydrocarbons in marine benthic and shoreline sediments, attributable to the released hydrocarbon, are not significantly higher than baseline or similar non-impact sites. In the absence of baseline or similar non-impact sites data, concentrations are below marine sediment quality interim guideline levels within the ANZG (2018), or the relevant regulatory site-specific trigger level (where these exist), if this is lower. For infauna assemblages, abundance and species diversity/richness/composition are not significantly different from baseline (where baseline data exists) or are not statistically significantly different from comparable non-impacted benthic infauna assemblages. Forensic fingerprinting of the released hydrocarbon and sediment quality samples by way of GC/MS may be used to determine the source of contaminants where this is not otherwise clear from operational monitoring.
Receptor impact	Impact to sediment quality is measured through change in hydrocarbon content and concentration. Change to sediment quality is also reflected by changes to infaunal assemblages. Potential impact to infaunal assemblages are measured through change(s) in: + Taxonomic diversity + Assemblage composition + Abundance of indicator species Other pressures to these states are: + Discharge of other toxicants + Physical disturbance including dredging + Sedimentation + Introduction of marine pests

SMP2 – Sediment Quality	
	+ Shading from marine infrastructure + Climate change
Methodological approach	Overall sampling design approach will be enacted according to the availability of baseline data guided by the structured decision-making process based on Gregory et al. (2012): 1. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied; 2. If insufficient long-term baseline data is available, where appropriately matched baseline data sites are impacted and non-impacted, a before-after-control-impact (BACI) approach to monitoring will be applied; 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied. See **Appendix B** and **Figure 1** for detailed description of these approaches. The selection of potentially impacted and non-impacted sites will be informed by Operational Monitoring, including operational water quality monitoring and spill trajectory modelling. Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design <u>Sediment quality</u> Operational Monitoring (including spill trajectory modelling) and the results of SMP1 Marine Water Quality monitoring will be used to inform the location of potentially impacted sediment sites. Sediment monitoring sites in nearshore and shoreline locations will also consider and align where practicable, with sites selected for habitat monitoring (i.e. SMP3, 4, 5 and 6). Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design. At each site, replicate sediment samples will be taken including those for QA/QC purposes. Sediment grab (i.e. Van Veen or Box corer) or coring equipment will be selected based on water depth (offshore, inshore or shoreline) and sample size requirements. Sediment sample collection and handling will align with Standard operating procedures found in the Oil Spill Monitoring Handbook (Hook et al. 2016), specifically the following sections according to sampling equipment utilised: + Appendix G hydrocarbon analysis (Grab samplers) + Appendix H hydrocarbon analysis (Ship borne corer) + Appendix H Manual push corer, and + Appendix O Sediment infauna. The laboratory(ies) will inform and supply the appropriate sample containers, storage requirements, holding times, detection limits/limit of reporting for required analytes and the analysis required for each sediment sample.

SMP2 – Sediment Quality	
	Sediment samples shall be analysed for key contaminants of concern including metals, hydrocarbons, nutrients, particle size distribution, and nutrients. <u>Infauna samples</u> A subset of the sediment sample shall be sieved in the field (if time permits) with collected infauna preserved (10% buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of infauna to lowest taxonomic resolution possible. eDNA will also be collected to detect for the presence of marine infauna species in sediments. Sediment will be removed from the surface of a subset of the sediment sample and sent to an appropriate laboratory for analysis.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP having been activated.
Resources	+ Marine scientist with field experience in deep sea sediment sampling + Scientist with skills in infauna identification + GIS personnel + NATA accredited laboratory for sample contaminant analysis + Laboratory for infauna sorting and taxonomic identification + Vessel with appropriate davit/winch to deploy grab/corer equipment and tender in operation + Refuelling facilities + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be capable of mobilising within 72 hours of the SoW having been approved by Santos. Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Sediment samples analysed by NATA-accredited laboratories for presence and concentrations of hydrocarbons associated with the spill including full suite PAHs and total organic carbon. A government endorsed laboratory for forensic fingerprinting (GC/MS) will be used. Infauna samples sorted and identified by qualified marine invertebrate specialist to acceptable taxonomic groups. Data will be entered to spatially explicit database and analysed statistically in order to detect significant differences among sites. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review

SMP2 – Sediment Quality	
	of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP3 – Sandy Beaches and Rocky Shores	
Rationale	Contact of entrained oil and stranded floating oil of shoreline habitats may occur on sandy beaches and rocky shores. Rocky and sandy shores provide habitat for a variety of intertidal organisms, which in turn provide food for shorebirds. Large tides tend to create a large degree of horizontal zonation amongst taxa. Rocky and sandy shores are included within the one receptor as they are often spatially mixed and both represent high energy regions.
Aim	To monitor changes in biota of sandy and rocky shoreline habitats in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available databases shall be reviewed for applicable rocky shoreline and sandy beach biota baseline data.
Initiation criteria	+ Operational monitoring, SMP1 or SMP2 indicates that rocky and/or sandy shorelines are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Shoreline assemblage structure, and hydrocarbon concentration levels in representative invertebrate species, are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages; AND SMP2 Sediment Quality monitoring at the site has been terminated AND Shoreline clean-up at the site has been completed.
Receptor impact	Impact to shoreline invertebrates from pressures including hydrocarbons is measured through change in: + Species diversity + Assemblage composition + Abundance of indicator taxa. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Litter/waste + Introduction of marine pests

SMP3 – Sandy Beaches and Rocky Shores	
	+ Over-collection + Nutrification + Climate change.
Methodological approach	Monitoring will be designed as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, a post-spill pre-impact (preferable) or gradient approach to quantifying impacts will be applied. Owing to potentially high spatial variation in assemblage structure, post-spill pre-impact monitoring will be a priority where no baseline data exists. If this opportunity is not available, a gradient approach to monitoring will be applied. Sampling frequency will be dictated by the number and location of sampling sites and the philosophy of the sampling design. Rocky shoreline intertidal assemblages (fauna and flora) will be monitored using a quadrat/transect approach, with the positioning of quadrats/transects accounting for any natural variation in assemblage structure along a seaward-landward gradient. Assemblage structure to be recorded through in-situ counts of fauna and flora or still images taken for further analysis. Sandy shoreline infauna will be sampled by way of replicated grab/core samples. Sampling sites within impacted and non-impacted areas to consider any cross-shore gradient in assemblage structure that may exist. Where baseline data exists, the methodology will be adapted to available data so that results are comparable. Samples to be sieved with collected infauna preserved (10% buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of fauna to lowest taxonomic resolution possible. Process to follow that for baseline data where this pre-exists. Biomonitoring of hydrocarbon concentrations in shoreline invertebrates will occur through collection of replicated tissue samples from representative, and preferably widely available species, across impact and non-impacted locations. The laboratory(ies) will supply and inform the appropriate method for collection, storage and holding times of tissue samples for required laboratory analysis and to avoid cross-contamination among samples. Where limitations in the distribution and abundance of representative invertebrate species preclude collection of sufficient samples for analysis, in-situ biomonitoring using a locally available species (e.g. the use of caged oysters) shall be considered for assessing spatial and temporal changes in bioaccumulation of hydrocarbon concentrations in invertebrates across impact and reference sites.

SMP3 – Sandy Beaches and Rocky Shores	
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in shoreline macroinvertebrates sampling + Supporting Scientist + GIS personnel + Helicopter or available vessel and tender in operation + Refuelling facilities + Sample containers and preservative + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Laboratory facilities for sorting and taxonomic identification of specimens
Implementation	With the aim of collecting post-spill pre-impact data, service provider able to mobilise within 72 hours of the SoW having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Specimens not identified in situ (in the field) will be processed and identified in the laboratory by appropriately qualified scientists. Biota tissue samples (if collected) analysed for hydrocarbon contaminants by NATA-accredited laboratories. Data will be entered to spatially explicit database and analysed in order to test for significant difference between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
Rationale	In the event of Tier 2 or 3 spill, mangroves may be contacted by floating or entrained oil. Mangrove health may be adversely affected due to increased concentration of hydrocarbons in sediments and coating due to surface oil, which in turn can lead to leaf-loss, mortality and a reduction in areal extent of mangrove habitat. This plan's focus is mangrove vegetation. Associated monitoring of sediment quality and mudflat fauna is described in SMP2 and SMP5, respectively.

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
Aim	To monitor changes to mangrove extent and health in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). Baseline extent and of mangroves is monitored by remote sensing in several regions, and further historical and post-impact data for mangrove health and extent can be obtained as remotely sensed imagery (e.g., Sentinel, Landsat and WorldView).
Initiation criteria	Operational Monitoring, SMP1 or SMP2 indicates that mangroves are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Mangrove extent and health are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted mangroves; AND Sediment quality monitoring (SMP2) at the site has been terminated; AND Shoreline response at the site has been completed.
Receptor impact	Impact to mangroves from pressures including hydrocarbons is measured through change in: + Tree health + Aerial extent. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Litter + Introduction of marine pests + Dust + Sedimentation from human activities + Climate change.
Methodological approach	Remote sensing data will be accessed for the purpose of detecting change in aerial cover and change in canopy health through and index of plant health (e.g., NDVI or MSAVI) (Astron Environmental Services 2013). Where long term on-ground baseline monitoring has occurred, further post impact on-ground monitoring should be carried out to complement any analysis of remote sensing. Analysis of long-term on-ground monitoring data will be as follows: 1. Where long-term baseline data sites (only) are contacted a control chart (time-series) design will be applied.

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
	1. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 2. Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1,** detailed in Baseline Data Review (Astron Environmental Services 2019) (QE-00-BI-20001)). On-ground monitoring of mangroves will aim to detect change in mangrove health, including canopy cover and plant/leaf health indices. Field methodology will follow the routine monitoring techniques currently employed for Santos operations (Quadrant Energy Australia Limited 2018), adapting where required to align with pre-existing baseline field data, where available. Sampling of sediments as per SMP2 will occur at mangrove health assessment sites to allow any changes in mangrove health to be related to sediment hydrocarbon levels. In-field mangrove health sampling frequency will be dictated by the number and location of sampling sites and the sampling design applied.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in mangrove condition assessment + Supporting Scientist + GIS and remote-sensing personnel + Available vessel in operation + Satellite and/or aerial imagery
Implementation	On-ground monitoring will only occur where long-term baseline data has been collected, and hence no post-spill pre-impact data collection will be required. On-ground post-spill data will be collected at an appropriate time as guided by the analysis of remote sensing imagery, and potential on-ground assessment.
Analysis and reporting	Data will be entered to spatially explicit database and analysed in order to test statistically significant change to parameters associated with hydrocarbon spill. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
Rationale	Intertidal mudflat communities are primary producer habitats which support invertebrate fauna, which in turn provides a valuable food source for shorebirds. High diversity of infauna (particularly molluscs) occur within these habitats and may be affected by

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
	penetrating oil. At high tide, these habitats become foraging grounds for vertebrates such as rays and sharks. These habitats are at high risk of impact as the sheltered environments promote high faunal diversity combined with low-energy wave action.
Aim	To monitor changes in intertidal mudflat communities associated with an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available baseline databases shall be reviewed for applicable intertidal mudflat infauna baseline data.
Initiation criteria	+ Operational Monitoring, SMP1 or SMP2 indicates that mudflat habitats are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Mudflat infaunal assemblages are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages; AND SMP2 Sediment Quality monitoring at the site has been terminated; AND Clean-up of the shoreline site has been completed.
Receptor impact	Impact to mudflat epifauna and infauna from pressures, including hydrocarbons, is measured through change in: + Species diversity + Assemblage composition + Abundance of indicator taxa. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Overfishing (bait collecting) + Introduction of marine pests + Climate change.
Methodological approach	Monitoring will be designed as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved a post-spill pre-impact (preferable) or gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**).

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
	Owing to potentially high spatial variation in assemblage structure, post-spill pre-impact monitoring will be a priority if baseline data are not available. If this opportunity is not available, a gradient approach to monitoring will be applied. Mudflat infauna will be sampled by way of replicated grab/core samples. Sampling sites within impacted and non-impacted areas to consider any cross-shore gradient in assemblage structure that may exist. Where baseline data exists methodology to adapt to available data such that results are comparable. Sites selected for mudflat infauna sampling to be concurrently sampled for sediment quality as per SMP2. Sampling frequency will be dictated by the number and location of sampling sites and the philosophy of the sampling design. Samples to be sieved with collected infauna preserved (buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of fauna to lowest taxonomic resolution possible. Process to follow that for baseline data where this pre-exists.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in epifauna and infauna assessment and sampling + Supporting Scientist + GIS personnel + Helicopter or available vessel and tender in operation + Refuelling facilities + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	With the purpose of collecting post spill pre-impact data, service provider able to mobilise within 72 hours of the scope of work having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilization time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database and analysed to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP6 – Benthic Habitats	
Rationale	Benthic habitats are those habitats associated with the seafloor. Major benthic habitats at risk are: + Coral reefs (likely high susceptibility to spill) + Macroalgae and seagrass (likely moderate susceptibility to spill) + Non-coral benthic filter feeders (likely moderate susceptibility to spill) + Sub-tidal pavement (likely moderate susceptibility to spill) + Soft-substrate (likely lower susceptibility to spill). Macroalgal and seagrass communities are important primary producers that also provide habitat, refuge areas and food for fish, turtles, dugongs, and invertebrates. Seagrass and macroalgae also increase structural diversity and stabilise soft substrates. Non-coral benthic filter feeders, which include sponges, molluscs, sea whips and gorgonians, are considered indicators of disturbance due to their immobility and long life cycles. Corals are important primary producers that provide food, substrate, and shelter for a diversity of marine life, including invertebrates and fish. They also protect coastlines from wave erosion and provide important substrate for algae. Undisturbed intertidal and subtidal coral reefs occur in several locations throughout the region.
Aim	To monitor changes in the cover and composition of benthic habitats in relation to an oil spill and associated activities. To monitor change in hard coral health and reproduction in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available baseline metadata databases will be reviewed for applicable benthic habitat and coral health and reproduction baseline data. Remote sensing data, satellite and aerial imagery previously acquired may also be applicable for shallow clear-water benthic habitats to detect changes in benthic habitat cover and composition. Pollution-induced change to benthic habitat cover and composition may take some time to be detected. Therefore, post-spill, pre-impact benthic survey data will be collected when required to have a baseline state following initial oil contact.
Initiation criteria	<u>Benthic habitat cover and composition</u> Operational Monitoring, SMP1 or SMP2 indicates that subtidal benthic habitats are contacted or are predicted to be contacted by a hydrocarbon spill. <u>Coral health and reproduction</u> + Operational Monitoring, SMP1 or SMP2 indicates that coral habitat is contacted or is predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.

SMP6 – Benthic Habitats	
Termination criteria	Benthic habitat cover and composition Cover and composition of benthic habitats are not statistically significantly different from that of their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages. Coral health and reproduction Hydrocarbon concentration in corals, reproductive state and settlement indices are not statistically different from the baseline state (where baseline data exists) or from comparable non-impacted assemblages.
Receptor impact	Impact to benthic habitats from pressures including hydrocarbons is measured through change in: + Species diversity + Assemblage composition + Percent cover. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Introduction of marine pests + Shading + Climate change.
Methodological approach	Monitoring design will be as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**). Benthic Habitat Cover and Composition Field survey methodology will be based upon acquiring repeat digital imagery (video or still images) of benthic habitats along random transects (preferable), using a stratified sampling approach at each site to target different habitat types and depths where clear gradients in these conditions exist. Site selection and image acquisition methodology will aim to align applicable baseline studies where these exist, such that imagery is comparable. The number of sites and frequency of sampling will depend upon the sampling design philosophy.

SMP6 – Benthic Habitats	
	Divers, towed video or remotely operated vehicles (ROVs) will be employed to collect imagery considering safety aspects and the depth of water at survey locations. Where divers are employed, fish species may also be recorded where practicable (for example following methodologies employed by Babcock et al. (2008) to contribute to SMP11. <u>Coral Health and Reproduction</u> Using divers, selected coral colonies will have tissue samples removed for the purpose of laboratory analysis of the concentration of accumulated hydrocarbons and for determining reproductive state, noting sampling for reproductive state will be dependent upon the timing of coral spawning. Reproductive state will be determined from measures of gamete size, stage and fecundity determined from in-field examination and laboratory analysis of histological samples. In addition to the standard suite of ecotoxicology testing done on the released hydrocarbon as part of the Operational Monitoring Program, ecotoxicology testing of the released hydrocarbon on the larval competency of representative coral species will be conducted. Settlement plates will be deployed to monitor settlement of coral recruits following spawning periods to ascertain the level of coral recruitment at impacted and non-impacted sites.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Marine Scientist with experience in benthic habitat assessment + Supporting Scientist + Divers or ROV operators + GIS personnel + Available vessel in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Diving equipment or ROVs + Video recording facilities + Satellite imagery
Implementation	Service provider is to be able to mobilise within 72 hours of the SoW being approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.

SMP6 – Benthic Habitats	
Analysis and reporting	Digital imagery will be analysed using a point-count technique (using software such as AVTAS, Coral Point Count with Excel extensions (CPCe) or TransectMeasure (SeaGIS)) to estimate the percentage cover of biotic and abiotic categories (in line with the CATAMI classification scheme) comprising the benthic habitat. Biotic categories to include the following as applicable: corals; macroalgae and seagrass; and non-coral benthic filter feeders. Live, dead and bleached coral cover shall be recorded. The imagery collected will allow for the determination of percent cover, abundance, measurement of size (if scaling lasers are included in the image) and a visual assessment of health (Kohler and Gill 2006). NATA accredited laboratory analysis to determine the concentration of hydrocarbons within coral tissue. Reproductive output to be determined by complementary means, including in-field and laboratory analysis of gametes, including microscopic examination of histological samples preserved in the field. Coral larval competency tests to be conducted by ecotoxicological laboratory in addition to standard suite of ecotoxicological tests using released hydrocarbon. Data will be entered to spatially explicit database and analysed to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card provided as part of report. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP7 – Seabirds and Shorebirds	
Rationale	Marine waters and coastal habitats in the EMBA contain key habitats that are important to birds, including offshore islands, sandy beaches, tidal flats, mangroves and coastal and pelagic waters. These habitats support a variety of birds which utilise the area in different ways and at different times of the year. Birds can be broadly grouped according to their preferred foraging habitat as coastal/ terrestrial birds, seabirds and shorebirds, both migratory and resident. For the purposes of this document, seabirds and shorebirds are defined as: + shorebirds – those birds that inhabit and feed in the intertidal zone and adjacent areas and are resident or migratory, using the area principally during the austral summer. + seabirds – those birds associated with the sea and deriving most of their food from it, and typically breeding colonially, including the marine raptors osprey and white-bellied sea eagle.
Aim	Quantify seabirds and shorebirds, in the spill and response areas.

SMP7 – Seabirds and Shorebirds	
	Quantify lethal and/or sub-lethal impacts of hydrocarbon spill exposure on seabirds and shorebirds. Monitor changes in seabird populations (reproductive success) in relation to the hydrocarbon spill and clean-up activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (Department of Agriculture, Water and the Environment (DAWE) (http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and any local oiled wildlife response plans should also be consulted.
Initiation criteria	Operational monitoring indicates that known foraging, roosting or nesting areas for seabirds and/or shorebirds has been contacted, or are predicted to be contacted, by a hydrocarbon spill; OR Operational monitoring indicates that seabirds and shorebirds have been contacted, or are predicted to be contacted, by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Detectable levels of hydrocarbons attributable to the hydrocarbon spill are not present in seabird and shorebird tissues; AND Measured variables are not statistically significantly different from their baseline or pre-spill state (where these data exist) or from measured variables at non-impacted sites; AND Monitoring is terminated in consultation with the relevant environmental authority (relevant regional authority and/or DAWE).
Receptor impact	Impact to seabirds and shorebirds from pressures including hydrocarbons is measured through change in: + Species diversity + Bird abundance + Health/condition + Breeding success (resident species only). Other pressures to these states are: + Physical disturbance of foraging and nesting habitat + Accidental chemical spillage + Entanglement in litter + Displacement by less favourable species (e.g. Silver Gull) + Predation + Climate change.

SMP7 – Seabirds and Shorebirds	
Methodological approach	Monitoring design will be as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. Given the ease of survey establishment, post-spill pre-impact monitoring will be attempted wherever practicable in order to established pre-impact state. 3. Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1,** detailed in Baseline Data Review (Astron Environmental Services 2019) (QE-00-BI-20001)). Monitoring for seabirds and shorebirds will measure abundance and diversity in key foraging/roosting areas with the timing of surveys to coincide with seasonal peaks in abundance. The seabird and shorebird roost count monitoring will follow current accepted survey methodology, such as Birdlife Australia's Australian Shorebird Monitoring Program and survey guidelines standardised by the DAWE (Department of the Environment and Energy 2017). Monitoring of seabirds to focus on nesting (burrow) density, breeding participation and breeding success, taking measurements of the number of adults, eggs and chicks with the timing of surveys to allow assessments immediately after egg laying and immediately prior to chick fledging. Bird mortality to be recorded during monitoring of seabirds and shorebirds with tissue samples taken from dead birds for hydrocarbon analysis in the laboratory. Necroscopies will follow the process of Gagnon and Rawson (2010).
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Experienced seabird biologist + Experienced shorebird biologist + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the scope of work having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site).

SMP7 – Seabirds and Shorebirds	
	Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database and analysed in order to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Draft annual report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP8 – Marine Mammals	
Rationale	At least 11 species of listed marine mammals are known to, or are thought to occur, in Australian waters within the environment that may be affected. These include cetaceans (whales and dolphins) and sirenians (dugong). Effects to marine megafauna due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical effects. Given large spatial variation in occurrence and broad scale movement, population estimates, and associated change are not often available. This plan will focus on assessing the extent of impacts to animals within the region, and where possible, the level of recovery. This will then be used to deduce potential impacts at a population level.
Aim	To monitor short and long-term environmental effects on marine mammals that may have resulted from the hydrocarbon spill and associated response.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (DAWE -http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and local oiled wildlife response plans should also be consulted.
Initiation criteria	Operational monitoring indicates that marine mammals are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Restoration or resumption of key biological processes (e.g. abundance, distribution, breeding) necessary to ensure post-impact recovery is demonstrated. Specific criteria to be developed by Marine Scientist(s) with expertise in marine mammals of the region; AND No further instances of dead marine mammals with detectable levels of hydrocarbons attributable to the hydrocarbon spill; AND Monitoring is terminated in consultation with the relevant environmental authority (relevant regional authority and/or DAWE).

SMP8 – Marine Mammals	
Receptor impact	Impact to marine mammals from pressures including hydrocarbons is measured through observed injury and mortality. Other pressures to these states are: + Physical disturbance + Entanglement in fishing gear and litter + Accidental chemical spillage + Climate change + Over-exploitation.
Methodological approach	Aerial and marine surveys will be implemented to identify individuals in proximity of the spill and to quantify damage: + Aerial surveys will follow the protocols of Hedley et al. (2011), **Appendix C8** + Marine surveys will follow the protocols of Watson et al. (2009), **Appendix C8** Tissue sampling of dead or injured animals will follow the protocols of: + Department of Environment and Heritage (DEH) (2006) (Cetaceans) + Eros et al. (2000) (Dugongs).
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	**Aerial survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities **Vessel-based survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel in operation + Sample container and preservative + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby

SMP8 – Marine Mammals	
Implementation	Service provider able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database. Data and conclusions will be summarised in an environmental report card. Statistical power related to these receptors is likely to be low, due to observational data and small sample sizes. Therefore, the assessment of quantified impacts will be corroborated with marine scientist(s) with expertise in relevant fauna. Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP9 – Marine Reptiles	
Rationale	At least 10 species of listed marine reptiles are known to, or are thought to occur, in Australian waters within the environment that may be affected. This includes six species of marine turtle that occur in, use the waters, and nest on sandy beaches, two species of sea snake and one species of estuarine crocodile found in most major rivers systems of the Kimberley region and in the Northern Territory. Impacts to marine reptiles due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural, physiological (e.g. disruption to digestion) or physical effects.
Aim	To observe and quantify the presence of marine reptiles in the spill and response areas, and broader regional areas. To assess and quantify lethal impacts or sub-lethal impacts of this exposure or interactions. To monitor changes in marine reptile populations in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (DAWE -http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and local oiled wildlife response plans should also be consulted.
Initiation criteria	Operational monitoring indicates that marine reptiles or nesting sites are contacted or likely to be contacted by a hydrocarbon spill; OR Operational monitoring indicates that marine reptiles are contacted, or are predicted to be contacted, by a hydrocarbon spill as defined in **Table 1**.

SMP9 – Marine Reptiles	
Termination criteria	Detectable levels of hydrocarbons attributable to the hydrocarbon spill are no longer present in marine reptile tissues collected from live or dead individuals; AND In the event that an impact attributable to the hydrocarbon spill is detected on marine reptiles, the measured parameters are not statistically significantly different from their baseline or pre-spill state (where these data exist) or from measured parameters at non impacted sites; AND Monitoring is terminated in consultation with the relevant environmental authority (relevant regional authority and/or DAWE).
Receptor impact	Impact to marine reptiles from pressures including hydrocarbons is measured through change in: + Abundance + Health/condition + Nesting success (turtles and crocodiles). Impact to other marine reptiles from pressures including hydrocarbons is measured through change in observed injury and condition. Other pressures to these states are: + Lighting and flares causing disorientation (turtles) + Vessel strike + Physical disturbance of nesting sites + Predation + Entanglement in fishing gear and litter + Accidental chemical spillage + Habitat loss or change due to dredging + Climate change + Over-exploitation.
Methodological approach	**Abundance** In-water impacts – aerial surveys. Shoreline impacts – ground surveys (either rapid census survey or tagging program). **Health/condition** In-water impacts – vessel surveys (collecting observations on animal condition and collection of tissue samples or dead specimens for analysis). Shoreline impacts – ground surveys (collecting observations on animal condition and collection of tissue samples or dead specimens for analysis). Dead reptiles will be collected for autopsy following Gagnon (2009).

SMP9 – Marine Reptiles	
	Reproductive success Shoreline impacts – ground surveys (detailed tagging and/or nesting success studies). Design of ground surveys will be applied as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, and timing allows, a post spill pre-impact approach will be attempted. 4. If a post-spill pre-impact approach is not practicable, a gradient approach to quantifying impacts will be applied
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	**Aerial survey** + Senior marine scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities **Vessel-based Survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database. Turtle data will be analysed in order to test for significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card.

SMP9 – Marine Reptiles	
	Owing to their observational nature and potentially low sample size, observed impacts to other reptile fauna will be corroborated with marine scientist(s) with expertise in relevant fauna for the region. Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP10 – Seafood Quality	
Rationale	Exposure of commercial and recreationally targeted demersal and pelagic fish species to entrained and dissolved aromatic hydrocarbons can cause flesh tainting and increase the levels of toxicants above human consumption guidelines. Aromatic hydrocarbons are carcinogenic to humans. This scope includes finfish, sharks and invertebrates (principally crustacea).
Aim	To identify potential human health risks due to the presence of hydrocarbon concentrations in the flesh of targeted seafood species for consumption.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). Human health benchmarks relating to the exposure of PAHs shall be used to determine health effects as per Yender et al. (2002). Flesh samples from non-impacted sites to be used as baseline for olfactory analysis for flesh taint.
Initiation criteria	+ Operational monitoring and results from SMP1 predict or observes contact of oil to target species for consumption as defined in **Table 1**.
Termination criteria	The following termination criteria will be adopted in consultation with responsible fisheries and human health agencies. Hydrocarbon concentrations in seafood tissues are not above levels considered a human health risk; AND Flesh taint is not detected from olfactory testing of seafood samples; AND Target species are no longer exposed to hydrocarbons in the water column.
Receptor impact	Impact to seafood quality from hydrocarbons is measured through change in: + Toxicity indicators + Olfactory taint. Other pressures to these states are: + Accidental chemical spillage + Disease.

SMP10 – Seafood Quality	
Methodological approach	Target fish species determined from water quality monitoring results and relevant and available commercial and recreational-fished species. Sampling of target species will follow a gradient design (Gagnon and Rawson 2012) ranging from impacted to non-impacted (or non-suspect) catches using commercial and recreational fishing techniques undertaken by commercial and recreational fishers. Sampling method (netting, trawling, baited fish traps, spear fishing, line fishing) will be determined by habitat, target species and spill location. If more than one target species is affected, replicate samples of each species shall be collected, with a minimum of five replicate samples. Olfactory testing will follow Rawson et al. (Rawson et al. 2011) in **Appendix C10**, following the duo-trio method (Standards Australia 2005).
Scope of work	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Marine vessel + Sample containers and preservative + NATA accredited laboratory for sample analysis + Decontamination/washing facilities
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Laboratories will be NATA-accredited for food standards analyses. Data will be stored in spatially explicit database and analysed to test for significant differences between impacted and non-impacted seafood. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP11 – Fish, Fisheries and Aquaculture	
Rationale	Impacts to fisheries species due to presence of entrained hydrocarbons may include lethal and sub-lethal physiological effects (e.g. reduced growth) and physical effects. The region comprises the Indo-West Pacific area which consists of a high diversity of fish species and assemblages and provides important spawning and nursery grounds for several fisheries species. Fish are concentrated in a number of biodiversity hotspots. The environment is also conducive to aquaculture including pearl production. Fisheries species that spawn or

SMP11 – Fish, Fisheries and Aquaculture	
	inhabit near shore areas face a greater risk to an oil spill than finfish found in deeper waters.
Aim	To monitor changes in structure and distribution of fish assemblages in relation to an oil spill and associated activities. To monitor the effect of hydrocarbon exposure and physiological condition on fisheries and aquaculture species.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, available relevant survey databases shall be reviewed for applicable baseline data.
Initiation criteria	+ Operational monitoring indicates fish, fisheries or aquaculture are contacted or likely to be contacted by a hydrocarbon spill as defined in Table 1.
Termination criteria	Fish assemblages are not statistically significantly different than those of baseline or similar non-impacted assemblages; AND Hydrocarbon concentrations, physiological condition indices, and biomarker levels in affected fish and aquaculture species are not statistically significantly different from those of non-impacted samples; AND Termination of monitoring is done in consultation with the responsible fisheries agencies.
Receptor impact	Impact to fish, fisheries and aquaculture from pressures including hydrocarbon concentrations is measured through change in: + Species diversity + Abundance of indicator taxa + Assemblage structure + Health. Other pressures to these states are: + Accidental chemical spillage + Overfishing + Introduction of marine pests + Habitat disturbance + Climate change.
Methodological approach	Fish assemblages will be assessed using the stereo-baited remote underwater videos (BRUVs) following Shortis et al. (2009), **Appendix C11**. Fish assemblages will be randomly sampled within discrete habitats at cross-shelf impact areas and non-impact areas.

SMP11 – Fish, Fisheries and Aquaculture	
	Sampling design for fish assemblages will be as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. If baseline data is not available, a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**). Where relevant, data available from responsible fisheries agencies including catch/effort data, will be assessed to determine potential changes from baseline levels in fishing grounds potentially affected by an oil spill compared to after the event. For fish and aquaculture species potentially exposed to an oil spill, species will be sampled across the contamination gradient as per Gagnon and Rawson (2012). Hydrocarbon concentrations (particularly PAH) within tissues of fish and aquaculture species will be determined. Exposure to hydrocarbons on fish health will also be determine through analysis of physiological indices and biochemical markers following Gagnon and Rawson (2012). If fish kills are observed, whole specimens will be obtained and preserved (frozen) for necropsy to determine the cause of death.
Scope of work	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Marine scientist trained in fish identification and necropsy + Marine scientist with BRUV experience + NATA accredited laboratory for sample analysis + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Resources to analyse BRUV data.
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	BRUV imagery will be processed using EventMeasure (SeaGIS) software. NATA-accredited laboratories will be employed for health analyses. Data will be entered to spatially explicit database and analysed to test for statistically significant differences between non-impacted and impacted fish assemblages.

SMP11 – Fish, Fisheries and Aquaculture	
	Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP12 – Whale Sharks	
Rationale	The whale shark (*Rhincodon typus*) is known to occur within the region. One of the best known aggregation sites occurs along the central and north-west coast of Western Australia from March to July. Whale sharks are also known to be highly migratory and a biologically important area for foraging extending into the Kimberley region of Western Australia also overlaps with the environment that may be affected. Effects to the whale shark due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical effects. Given large spatial variation in occurrence and broad scale movement, population estimates and associated change are not often available. This plan will focus on assessing the extent of impacts to animals within the region, and where possible, the level of recovery. This will then be used to deduce potential impacts at a population level.
Aim	To quantify impacts of an oil spill on whale sharks within Biologically Important Areas (BIAs) along the north-west and north Western Australian coastline.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (DAWE -http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and Pilbara Region Oiled Wildlife Response Plan (Department of Parks and Wildlife and Australian Marine Oil Spill Centre 2014) should also be consulted.
Initiation criteria	Operational monitoring indicates that whale shark aggregations are contacted or likely to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Measured parameters of whale shark abundance and distribution are not significantly different to baseline levels; AND The water quality at feeding/aggregation sites has been measured as not significantly different to baseline levels.
Receptor impact	Impact to whale sharks from pressures including hydrocarbons is measured through observed injury and mortality. Other pressures to these states are: + Intentional and unintentional mortality from fishing outside Australian waters

SMP12 – Whale Sharks	
	+ Boat strike + Habitat disruption from mineral exploration, production and transportation + Marine debris + Climate change.
Methodological approach	During spill activities may require the following surveys and sampling: + Aerial surveys + Satellite tagging + Toxicology + Food chain studies + Photo-identification + Vessel and plane logs + Acoustic tagging. The methodologies adopted will follow the approaches of those baseline studies identified allowing consistency of data from baseline to impact and recovery phases.
Scope of work	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

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Appendix O: SMP activation process

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Oil Spill Operational and Scientific Monitoring Activation Form

Instructions
In the event of a spill requiring a response from Astron follow these steps: **1. Activate a response – call 1300 902 700** **2. Immediately complete this Activation Form and email to spillresponse@astron.com.au** **You will receive a call back from the Monitoring Coordinator within 30 minutes. In the event that a call back is not received, please call 1300 902 700 again.** **Note:** If new information should become available after submitting this form, or the situation changes, please advise the Astron Monitoring Coordinator as soon as possible.

Section 1: Contact Details		
Name of notifying person		
Position in Incident Command Team		
Direct phone		
Mobile		
Email address		
Command centre location		
Command centre direct phone		
Date and time of notification	Click here to enter a date.	Enter time, i.e. 1400 WST

Section 2: Spill Details							
Date and time of spill		Click here to enter a date.			Enter time, i.e. 1400 WST		
Spill source location (GDA94, MGA Zone 50)		Insert coordinates in GDA94 MGA Zone 50 format (easting and northing).					
		Insert location description					
Source of spill							
Cause of spill (if known)							
Status of spill		☐ Secured	☐Uncontrolled	☐Unknown			
Release rate	Instantaneous release						**State units**
	OR						
	Continuous release		per hour for		☐Hours	☐Days	
Description of spill	Estimated quantity						**State units**
	Incident tier	☐1	☐2	☐3			
	Direction of travel						
	Trajectory						
Modelling provider log in details							

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Oil Spill Operational and Scientific Monitoring Activation Form

Section 3: OMP/SMP activation	
SMPs to be activated. Where there is doubt whether an SMP should be activated the SMP should be selected. Refer to the Oil Spill Scientific Monitoring Plan (EA-00-RI-10099) for initiation criteria for SMPS.	☒SMP1 – Water quality ☒Operational water quality monitoring ☐SMP2 – Sediment quality ☐SMP3 – Sandy beaches and rocky shores ☐SMP4 – Mangroves ☐SMP5 – Intertidal mudflats ☐SMP6 – Benthic habitats ☐SMP7 – Seabirds and shorebirds ☐SMP8 – Marine megafauna ☐SMP9 – Marine reptiles ☐SMP10 – Seafood quality ☐SMP11 – Fish, fisheries and aquaculture ☐ Yet to be determined ☐ Other:________________________________

Section 4: Safety	
Detail any known safety or security risks	

Section 5: Approval	
I authorise the activation of a response by Astron Environmental Services Pty Ltd in connection with the above incident under the terms of Contract # [insert contract].	
Signature:	
Date and Time:	

Activate Our Team

In the event of a spill requiring scientific monitoring response call:

1300 902 700

Advise the operator:

1. **Your company**
2. **Your name and contact number**
3. **Brief reason for call (i.e. Exercise or Spill)**

A message will be relayed to our team to call you back.

↓

Provide additional details as requested by the Monitoring Coordinator on call-back

↓

Complete and submit the *Activation Form*

↓

Astron initiates Oil Spill Scientific Monitoring Activation & Response Process – refer to next page

Oil Spill Scientific Monitoring Activation and Response Process

Step	Responsibility	Action	Timeframe[#]	Resources	Date/Time Complete
Phase 1 – Activation					
1	Santos IMT (Environmental Team Leader (ETL))	Astron Monitoring Coordinator notified of incident.	On approval from Santos Incident Commander	Astron oil spill response phone number and answering service	
2	Astron Monitoring Coordinator (MC)	Call back client for further details, request *Activation Form* if not received.	Within 30 minutes of receiving initial notification	Activation Form	
3	Astron MC	Call Planning & Logistics Officer to advise of incident.	Immediately following Step 2	n/a	
4	Santos IMT (ETL)	Complete *Activation Form* and submit to Astron via email.	Within one hour following initial notification (Step 2)	Activation Form	
5	Astron Planning & Logistics Officer (PLO)	Notify MCT, Technical Advisors and key subcontractors via SMS Global.	Within 30 minutes of Step 3	SMS Global Guidance	
6	Astron PLO	Notify all staff of incident via SMS Global.	Within one hour of receiving Activation Form	SMS Global Guidance	
Phase 2 – Response Planning					
7	Astron MC	Maintain verbal communication with Santos IMT (ETL).	At least twice daily (0800 and 1700)	n/a	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
8	Astron MC Astron Operations Officer Astron PLO	Maintain Functional Log.	Daily	Functional Log	
9	Astron PLO	Set up Command Room.	Within 4 hours of activation (Step 5)	Command Room Resource Checklist	
10	Astron MC, PLO and BMT Oceanica Operations Officer	Attend Santos incident briefing and relay information to MCT.	As advised by the Santos IMT (ETL)	n/a	
11	Astron Operations Officer	MCT and Technical Advisors to meet at Royal St office, review personnel and equipment resource status.	Within 6 hours of activation (Step 5)	Capability report Training matrix Resource chart	
12	Astron PLO	Confirm availability of additional personnel and equipment resources.	Within 16 hours of activation (Step 5)	External Supplier Details Requisition Request Form	
13	Santos IMT (ETL)	Provide spill trajectory modelling and sensitive receptor information to Astron.	When available	APASA modelling Department of Transport database Santos GIS Mapping	
14	Astron MC in consultation with Santos ETL	Define the scale of response - identify which SMPs are activated. Identify if operational water quality monitoring is required.	Within 2 hours of receiving spill and receptor information (Step 13).	Scientific Monitoring Plan* Relevant OPEP Spill trajectory modelling Operational monitoring results	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
15	Astron Technical Advisors in consultation with Santos ETL	**Determine monitoring locations for activated SMPs:** • Identify monitoring locations in order of priority for activated SMPs based on: o nature of hydrocarbon spill o spill trajectory modelling and time to shoreline impacts o sensitive receptors impacted or potentially at risk of being impacted o state of current baseline data o current environmental conditions o current results of operational monitoring. • Determine if post-spill pre-impact data is required to be collected from any locations. See SMP Work Method Statements for decision making process when considering availability of baseline data.	Within 6 hrs of relevant SMP activation (Step 14).	Relevant SMPs Information from Astron: • baseline information for relevant receptors. Information from Santos IMT: • sensitive receptor information (including relevant conservation/management plans) from relevant EP, Santos GIS mapping and online resources (DoT oil spill response atlas, DoE conservation values atlas, DoE species profile and threats database) • oil spill trajectory modelling • response strategies and priority protection areas • results from OMPs currently activated • baseline information for relevant receptors as reference in the relevant SMP.	
16	Astron Technical Advisors in consultation with Santos ETL	Submit Department of Parks and Wildlife Licence applications	Within 12 hrs of relevant SMP activation (Step 14)	• Proposed monitoring locations • SMP methods	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
17	Astron Operations Officer, PLO & Technical Advisors in consultation with Santos ETL	**Determine personnel requirements:** • Identify number and competencies of personnel required for monitoring teams for each SMP based on: o activated SMPs o number of locations to be monitored o number of locations where pre-spill baseline data needs to be collected o timing of hydrocarbon spill and overlap with sensitive receptors in activated SMPs o logistical and equipment resource constraints. • Arrange additional personnel if required.	Within 12 hrs of activation if pre-impact data is needed.**	Information from Astron: • Capability report • Training matrix • Resource chart • relevant SMPs and WMS. Information from Santos IMT: • sensitive receptor information • oil spill trajectory modelling • response strategies and priority protection areas • equipment (i.e. vessels, aircraft) availability • logistics (availability of flights, accommodation, etc).	
18	Astron Operations Officer, PLO & Technical Advisors in consultation with Santos ETL	**Determine equipment requirements:** • Identify number and competencies of equipment required for each SMP based on: o activated SMPs o number of locations to be monitored o number of field teams and timing of mobilisation to the field o logistical and equipment resource constraints. • Arrange additional equipment resources if required.	Within 12 hrs of activation if pre-impact data is needed.**	Information from Astron: • Resource chart • relevant SMPs and WMS. Information from Santos IMT: • equipment (i.e. vessels, aircraft) availability • logistics (availability of flights, accommodation, etc).	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
19	Astron MC, Operations Officer, PLO & Technical Advisors	**Prepare and submit Monitoring Action Plan** (mission, objectives, strategies, tactics, tasks), including scope of works. **Prepare and submit cost estimate.** **Prepare and submit logistics request:** • Allocate personnel and equipment resources to field teams for relevant SMPs. • Submit SOW and logistics request for each activated SMP to Santos IMT for approval.	Within 24hrs of request for SoW (Step 15) for relevant SMP if pre-impact data is needed.**	Information from Astron: • Resource chart • relevant SMPs and WMS • agreed monitoring locations • Mobilisation and Logistics Form (incorporating SOW) • Monitoring Action Plan. Information from Santos IMT: • request for SoW • agreed monitoring locations.	
20	Santos IMT (ETL)	Santos to approve SOW, provide purchase order and initiate logistical arrangements.	Within 24 hours of SOW submission (Step 19).	Astron Mobilisation and Logistics Request	
21	Astron MC	Advise field personnel by email meeting invite, or phone if not in office.	Within 24 hours of SOW approval (Step 20).	Field team allocation	
22	Astron	Conduct incident briefing with all available Astron personnel.	Within 24 hours of SOW approval (Step 22).	Briefing template Monitoring Action Plan	
Phase 3 – Mobilisation					
24	Astron PLO	GIS and device preparation requests (field maps, data capture) submitted, and discussed with Geospatial team.	Within 24 hours of SOW approval (Step 22).	https://voyager/	
25	Astron Operations Officer	Conduct field team overview briefing, allocate tasks.	Within 36 hours of SOW approval (Step 22).	Briefing Template	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
26	Field Team Leaders	Compile SMP grab packs, GIS information, field equipment, and prepare and submit HSE documentation to Santos IMT.	Within 48 hours of SOW approval (Step 22).	Information from Astron • SoW • Grab packs, SMP WMS and HSE documentation • GIS information/field maps • field equipment. Information from Santos IMT: • booking and logistics confirmations.	
27	Astron Technical Advisors	Conduct scope specific pre-mobilisation briefings.	Prior to mobilisation.	Pre-mob Briefing Template	
28	Santos ETL	Santos to approve HSE plan.	Within 24 hours of receiving HSE Plan.	Mobilisation and Logistics Form HSE plan	
29	Astron PLO	Personnel mobilised to site.	Within 72 hrs of SOW approval (Step 22) if pre-impact data is needed.**	Approved SOW	
Phase 4 – Response Operations					
30	Astron MC	Conduct Monitoring Action Plan review with MCT and Technical Advisors and communicate to Santos IMT (ETL).	Daily	Monitoring Action Plan template	
31	Astron PLO	Hold post-demobilisation debrief with field teams.	Within 3 days of demobilisation.	Demob Meeting Template	
32	Santos ETL	Santos to arrange approval of Monitoring Action Plan revisions and any additional mobilisation/logistics requirements.	Daily or as required	Monitoring Action Plan Mobilisation and Logistics Form	
33	Astron Field Team Leaders	Provide activity reports to Santos ETL.	Daily	Daily Activity Report Template	

Timeframes are indicative and may be require adjustment where activities are dependent on information availability or affected by logistical constraints

*The Scientific Monitoring Plan (EA-00-RI-10099) provides the most up to date list of SMPs and activation criteria. Refer to the OPEP for operational water quality monitoring requirements.

**If post-spill, pre-impact data is not required then timeframes will be specific to each SMP. The lead times for resourcing, preparation of SoW and mobilisation of field teams may be longer depending on the timing of the spill, likely trajectory and life stages of receptors present or likely to be impacted.

For example, in SMP4 if post-spill, pre-impact data collection is not required then mangrove decline is likely to take several weeks to occur and there is lower priority for mobilisation of field teams for this SMP within the 72 hr timeframe. In this case, mobilisation within 30 days may be more appropriate.

Abbreviations

EMBA – Environment that May Be Affected
IMT – Incident Management Team
OMP – Operational Monitoring Program
OPEP – Oil Pollution Emergency Plan
Santos – Santos Energy Australia Limited
SMP – Scientific Monitoring Plan/Program
SoW – Scope of Works
WMS – Work Method Statement

Appendix P: Scientific monitoring capability

Scientific Monitoring Assurance and Capability Assessment

Assurance arrangements

Astron Environmental Services (Astron) is currently Santos' primary Monitoring Service Provider for the implementation of SMPs 1-11. A contractual arrangement exists with Astron to maintain standby arrangements as per the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162); Astron have the resourcing capability to implement a first-strike response at all times. Astron maintains a relationship with a primary sub-contractor (BMT) for the provision of scientific monitoring for those SMPs where Astron does not have the required capability. Between Astron and BMT, capability exists to deliver first strike resourcing against SMPs 1-11. SMP 12 will be conducted by capability obtained through the Australian Institute of Marine Science (AIMS).

Assurance on the continued maintenance of capability is provided through the delivery of monthly capability reports. These reports are generated by the Astron and BMT Planning and Logistics Officers and delivered to the Santos Spill Response Adviser along with a summary of any changes in resourcing, and if required, how gaps in resourcing have been managed. Since the establishment of the scientific monitoring contract in 2015 Astron has always demonstrated through this process that it has the required capability to meet first strike resourcing as per the standby services contract.

Santos ensures that Astron/BMT standby arrangements are adequate through its exercise and auditing program. Santos regularly conducts exercises and tests with Astron and BMT to ensure that Santos IMT roles and Astron/BMT monitoring roles are familiar with the SMP activation arrangements while providing spot checks on resource availability. Santos has previously also undertaken an audit of Astron against its Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162). Assurance activities to date have demonstrated a high degree of compliance with standby service requirements.

Continuous improvement

Santos is committed to further improving its oil spill scientific monitoring capability. To that end, Santos is participating in a Joint Industry Operational and Scientific Monitoring Plans project, governed through an APPEA-Industry Steering Committee. This project, being progressed throughout 2021, is working towards a joint-industry capability for implementing a common suite of oil spill operational and scientific monitoring plans. The project aims to deliver efficiencies in implementing and testing oil spill scientific monitoring arrangements while increasing the level of resourcing and capability available to participating companies.

Baseline Data and Capability Assessment

Santos is committed to undertaking a review of the status, availability, currency and suitability of existing baseline data for oil spill scientific monitoring sources every 2 years. The latest review was undertaken in 2021 by Astron (Baseline Data Review document SO-91-RF-20022) and looked at all high biodiversity value receptors in the Santos EMBA.

The Santos approach to undertaking a baseline assessment is to focus on those sensitive receptors for which modelling predicts contact within seven days at a probability > 5%. It is considered that contact[17] within seven

[17] Contact is defined as oil concentrations at sensitive receptors of >1 g/m^2 for surface oil and > 10 ppb for entrained and dissolved oil.

days would require an enhanced understanding of available baseline data to ensure a timely response. Given the MEFF Cessation of Production modelling indicates that there is no contact of sensitive receptors with a probability > 5% within seven days, no baseline assessment for this activity was undertaken.

Astron's overall capability and competency requirements are outlined in **Table P-1** and are deemed sufficient for a spill associated with the MEFF Cessation of Production activities taking into consideration the timeframes outlined in **Table P-2** and that it would be unlikely that all the locations listed would be contacted given they have been derived from stochastic modelling (note there was no probability of contact > 5% for the MDO spill scenario).

Table P-1: Astron Environmental Services Capability

SMP	No. personnel per team	No. teams	Survey type	Required Competencies
SMP 1 - Water quality	2	3	Undefined	One team member in each team to have experience in water sampling
SMP 2 - Sediment quality				One team member in each team to have experience in deep sea sediment sampling
SMP 3 - Sandy beaches/rocky shore SMP5 - Intertidal mudflats	2	2	Undefined	One team member in each team to have experience in shoreline macrofauna/infauna assessment
SMP 6 - Benthic habitats	2	2	Undefined	One team member in each team to have experience in benthic habitat assessment
				ROV operator or divers
SMP 7 - Seabirds/shorebirds	2	1	Ground survey	One team member in each team to be experienced ornithologist
SMP 8 - Marine mammals (can be concurrent with SMP9)	2	1	Aerial survey	Both team members to be experienced wildlife observers
	2	1	Vessel-based survey	Both team members to be experienced wildlife observers
SMP 9 - Marine reptiles (can be concurrent with SMP 8)	2	1	Aerial surveys	Both team members to be experienced wildlife observers
	2	1	Vessel-based survey	Both team members to be experienced wildlife observers
	2	1	Ground survey	One team member with experience in turtle survey techniques
SMP 10 - Seafood quality	3	2	Undefined	One team member in each team to have experience in fish identification and necropsy
SMP 11 - Fish, fisheries and aquaculture			Undefined	One team member in each team to have baited remote underwater video (BRUV) experience

Table P-2: Mutineer-Exeter Cessation of Production subsea LOWC modelling results for locations with a probability of contact > 5% (GHD, 2021)

Shoreline contact- Locations	Total contact probability (%) shoreline oil >10 g/m^2	Minimum arrival time >10 g/m^2 (days)
Clerke Reef MP*	15.3	24.5
Imperieuse Reef MP*	50.7	14.3
Southern Islands Coast	5.3	26.5
Muiron Islands	6.0	23.3
Submerged Locations	**Total contact probability (%) total submerged oil >10 ppb**	**Minimum arrival time >10 ppb (days)**
Montebello AMP	8.7	20.8
Rowley Shoals surrounds	16.7	11.7
Ningaloo Offshore	26.0	12.1

**Predominantly intertidal receptor apart from small dry emergent areas*

Appendix Q: 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 Command and Management Manual (SO-00-ZF-00025).

To facilitate a streamlined response, forward operational bases are required close to the response operational areas equipped with near duplicated IMT equipment and personnel.

Forward Operating Base (FOB)

For a significant Level 2/3 response requiring coordination of resources to be deployed to the field, Santos will establish an FOB. For a level 2/3 spill crossing from Commonwealth to State waters (cross-jurisdictional spills) DoT will establish an FOB.

For a MEFF cessation of production activity spill response, Santos will establish an FOB at the Santos Dampier facilities leased from Toll Energy. These facilities are located in Toll Energy's Yard 1 and Yard 2 on Streckfuus Road Dampier; the facilities consist of a conference room and multiple offices that could be used as break-out rooms. The Toll Energy Dampier facilities are connected to the Santos internet and telephone system. These facilities are also available to the DoT to establish an FOB for State based response.

Additional FOBs may be set up as operational requirements dictate. Based on shoreline areas that might be impacted, potential additional FOB locations include Port Hedland, Broome and Exmouth. **Tables Q-1 to Q-4** list local facilities with operational value for response in Port Hedland, Broome, Exmouth and Dampier respectively.

The IMT will develop a communication strategy to support the FOB/s and forward staging areas.

Table Q-1: Port Hedland facilities with operational values for response

Facility	Owner/Operator	Potential Uses
Port of Port Hedland	Pilbara Ports Authority	Staging area for vessel loading for spill response and equipment and waste management Storage of oil spill response equipment Vessel loading for spill response equipment and waste management Office facilities for Marine-based Command Centre
Port Hedland International Airport	Australian Government	Air freight spill response equipment. Storage sheds for oil spill response equipment Office facilities for Aviation-based Command Centre
The Esplanade Hospitality Inn Ibis Styles Cooke Point Holiday Park Kings at the Landing The Lodge Motel South Hedland Motel Others	Various (independent)	Spill responders and IMT accommodation Accommodation and messing for clean-up crew
Toll Ipec Freight Transport	Toll	Transfer yard for truck-based equipment deliveries and waste management, Boom Maintenance and Cleaning Facility Materials consolidation

Facility	Owner/Operator	Potential Uses
		Marine equipment storage, staging and repairs Oiled wildlife response centre Laydown/storage area Bunded washing facility
Go Marine Group Offices	Go Marine	FOB OCC Offices

Table Q-2: Broome facilities with operational values for response

Facility	Owner/Operator	Potential Uses
Port of Broome	Kimberley Ports Authority	Staging area for vessel loading for spill response and equipment and waste management Storage of oil spill response equipment Vessel loading for spill response equipment and waste management Office facilities for Marine-based Command Centre
Broome International Airport	Australian Government	Air freight spill response equipment Storage sheds for oil spill response equipment Office facilities for Aviation-based Command Centre
Broome Heliport	Australian Government	Air freight spill response equipment Storage sheds for oil spill response equipment Office facilities for Aviation-based Command Centre
Seashells Broome Moonlight Bay Suites Bayside Holiday Apartments Mangrove Hotel Blue Seas Resort Others	Various (independent)	Spill responders and IMT accommodation Accommodation and messing for clean-up personnel
Toll Mermaid Supply Base 1 Toll Mermaid Supply Base 2	Toll and Mermaid	FOB OCC Office Transfer yard for truck-based equipment deliveries and waste management, Broome Maintenance and Cleaning Facility Materials consolidation Marine equipment storage, staging and repairs Oiled wildlife response centre Laydown / storage area Bunded washing facility for oil booms

Facility	Owner/Operator	Potential Uses
Civmec Logistics Supply Base	Civmec	Transfer yard for truck-based equipment deliveries and waste management, Boom maintenance and Cleaning Facility Materials consolidation Marine equipment storage, staging and repairs Oiled wildlife response centre Laydown / storage area Bunded washing facility for oil booms
Quest Marine Services	QMS	Marine-based response Command Centre and Staging Area
Toll offices	Toll	FOB OCC Offices
Local boat ramp at Broome Town Jetty	Broome Council	Load out for near-shore marine based operations Boat launching

Table Q-3: Exmouth facilities with operational values for response

Facility	Owner/Operator	Potential Uses
Harold E. Holt Naval Base	Australian Government Department of Defence	Forward Operations Base Storage of oil spill response equipment Vessel loading for spill response equipment and waste management
Exmouth Marina	Shire of Exmouth	Staging area for vessel loading for spill response equipment and waste management
Learmonth Airport	Australian Government Department of Defence	Air freight spill response equipment.
Exmouth light airstrip	Exmouth council	Air freight spill response equipment. Dispersant operations base
Logistic Services Yard	Exmouth Freight Services	Transfer yard for truck-based equipment deliveries and waste management, Boom Maintenance and Cleaning Facility Response equipment storage
Tantabiddi/Bundegi Boat Ramp areas	Shire of Exmouth	Staging/storage area Load out for near-shore marine based operations Boat launching
Bhagwan/Jetwave/Base Marine Yards Exmouth	Exmouth	Storage/Laydown and Staging Area Materials consolidation Marine equipment storage, staging & repairs

Table Q-4: Dampier facilities with operational values for response

Facility	Owner/Operator	Potential Uses
Dampier Cargo Wharf	Pilbara Ports Authority	Staging area for vessel loading for spill response equipment and waste management Storage of oil spill response equipment Vessel loading for spill response equipment and waste management Office facilities for Marine-based Command Centre
Toll Dampier Supply Base	Toll Energy Logistics Pty Ltd	Staging area for vessel loading for spill response equipment and waste management
Karratha Airport	Australian Government Department of Defence	Air freight spill response equipment
Devil Creek accommodation Searipple Village	Santos /Sodexo Searipple Karratha	Spill responders and IMT accommodation Accommodation & messing for clean-up crew
Toll Energy Yard	Toll Energy Logistics Pty Ltd	Transfer yard for truck-based equipment deliveries and waste management, Boom Maintenance and Cleaning Facility Materials consolidation Marine equipment storage, staging & repairs Oiled wildlife response centre Laydown / storage area Bunded washing facility for oil booms
Local boat ramp at Dampier Yacht Club	Leased to Dampier Yacht Club	Load out for near-shore marine based operations Boat launching

Forward Staging Areas

Forward Staging Areas for shoreline operations will be set up at locations dictated by the shoreline impacts, as established by DoT as the relevant Control Agency.

Transport

Transportation on shoreline locations will be supported by 4x4 vehicles and all-terrain vehicles. These can be supplied by locally and nationally through hire/purchase 3rd parties and can be supplied internationally through the OSRL spill response capability.

Security

To ensure that the forward staging areas are secure, Santos can provide temporary fencing to contain facilities/equipment during the clean-up. Suppliers of temporary fencing are available in Dampier, Port Headland, Karratha and Exmouth, or larger quantities may need to be sourced from Perth. If required, the specialist services of security providers will be engaged.

Messing

Messing and catering facilities will be provided through one of Santos' current service providers, under local arrangements as determined by capacity and facilities geographically available.

Freight movements

The transportation of all equipment and service out of Denham, Carnarvon, Exmouth, Onslow, Karratha, Dampier, Port Headland, Broome, Perth or other locations, as required, will be through Santos' third-party logistics providers.

Security

To ensure that Staging Areas are secure, Santos can provide temporary fencing to contain operations/equipment during the clean-up; suppliers of temporary fencing are available in Darwin, Broome, Port Hedland and Dampier, or larger quantities may need to be sourced from Perth. If required, the specialist services of security providers will be engaged.

Accommodation

Accommodation options for field responders and FOB personnel will be dictated by proximity to their respective activity areas, to ensure maximum utilisation of the shift time available.

Mainland accommodation is available at Dampier/ Karratha, Onslow and Exmouth. Santos' Devil Creek accommodation close to Karratha may also be used.

Where possible local facilities will be used to accommodate response personnel, however transportable accommodation and messing facilities can be supplied through contract suppliers if required.

Santos has access to transportable accommodation and messing facilities supplied through Sodexo and its subcontractors.

Transportation to respective work sites would be facilitated via modal and multimodal transport solutions, dictated by the geographical constraints of each site. Under current contractual arrangements, Santos has access to transportation providers for Land, Air and Marine operations. In general, from accommodation locations to operational areas transport would be via road using the services of Santos' third-party supplier. Should additional services be required to meet the demand, this would be engaged under a Service Agreement as determined and authorised by the IMT.

Personal Protective Equipment

Santos would use the services of specialist providers of PPE for clean-up operations. All PPE would be sourced in Perth and transported by one of Santos' third-party logistics providers to the forward operating centres.

In the event of a spill incident Santos would engage the services of a third party to provide and maintain inventory for the duration of oil spill operations.

The disposal of contaminated PPE is provided by Santos' WSP.

PPE requirements for spill responders is detailed in the Santos Oil Spill Response Health and Safety Manual (SO-91-RF-10016).

Radio communications

Santos will use the services of a specialist communication provider to hire handheld and vehicle-mounted UHF radios to support response and clean-up personnel. Portable deployed repeater stations (battery or mains powered) can be positioned along the shoreline to provide a 'voting' system for transmitting and receiving during the clean-up operation. Communication equipment will be supplied through local, national, and international suppliers as the operational situation dictates.

For Exmouth region response operations Santos would request the use of Woodsides radio communication trailers based in Perth. These trailers are licensed for locations in Exmouth and along the Ningaloo coast and permit land, sea and air radio communications.