SO-91-BI-20011.02

Santos

Commonwealth Exploration Vessel Based Activity Oil Pollution Emergency Plan (OPEP)

PROJECT/FACILITY	Drilling and Completions
REVIEW INTERVAL	60 Months
SAFETY CRITICAL DOCUMENT	NO

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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
APPEA	Australian Petroleum Production & Exploration Association
API	American Petroleum Institute
AUV	Autonomous Underwater Vehicle
BIA	Biologically Important Area
CHARM	Chemical Hazard and Risk Management
CM	Control Measure
CMMS	Computerised Maintenance Management System
CPI	Corrugated Plate Interceptor
DAH	Dissolved Aromatic Hydrocarbons
DAWR	Department of Agriculture and Water Resources
DBCA	Department of Biodiversity, Conservation and Attractions
DoE	(Australian) Department of the Environment (now DoEE)
DoEE	(Australian) Department of the Environment and Energy (now DAWE)
DAWE	(Australian) Department of Agriculture, Water and Environment
DoF	Department of Fisheries
DoT	Department of Transport
DPaW	Department of Parks and Wildlife (now DBCA)
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environment Regulation
EMBA	Environment that May Be Affected
EP	Environment Plan
EPA	West Australian (WA) Environmental Protection Authority
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
EPO	Environmental performance outcome/objective
EPS	Environmental performance standard

Abbreviation	Description
ESD	Ecologically sustainable development
GHG	Greenhouse gases
HFC	Hydrofluorocarbons
HFO	Heavy Fuel Oil
IFO	Intermediate Fuel Oil
IMMR	Inspection, Maintenance, Monitoring and Repair
IMS	Invasive Marine Species
IMSMP	Invasive Marine Species Management Plan
KEF	Key Ecological Feature
LMS	Listed Migratory Species
LTS	Listed Threatened Species
MBES	Multi-beam echo sounding
MFO	Marine Fauna Observer
MNES	Matters of National Environmental Significance
MODU	Mobile Offshore Drilling Unit
MOU	Memorandum of Understanding
MP	Marine Park
NEBA	Net Environmental Benefit Analysis
NMSC	National Marine Safety Committee
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
NWS	Western Australia's North West Shelf
ODS	Ozone depleting substances
OPEP	Oil Pollution Emergency Plan
OPGGS(E)(R)	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSC	On-scene Commander
OSRL	Oil Spill Response Limited
P(SL)(E)R	State Petroleum (Submerged Lands) (Environment) Regulations 2012
PFC	Perfluorocarbons
SBP	Sub-bottom profiling
SF_6	Sulphur hexafluoride
SHP-MEE	State Hazard Plan for Maritime Environmental Emergencies
SSS	Side-scan sonar
TRP	Tactical Response Plan

Abbreviation	Description
VI	Varanus Island
VOO	Vessels of Opportunity
WAFIC	Western Australian Fishing Industry Council
WAOWRP	WA Oiled Wildlife Response Plan

1 Quick Reference Information

Parameter	Description	Further Information
Petroleum Activity	Vessel based site surveys involving geophysical and geotechnical survey techniques in Commonwealth waters	Section 2 of the EP
Modelled Spill Locations (Lat/Long)	<u>Area A – Bedout Basin</u> Latitude: 19°24'08.7" S Longitude: 117°55'44.6" E AND Latitude: 18°46'32.1" S Longitude: 118°59'55.9" E AND Latitude: 19°27'40.9" S Longitude: 119°19'42.3" E	Table 3-1 of the EP
	<u>Area B – Reindeer and Dancer</u> Latitude: 19°58'19.30" S Longitude: 116°20'56.51" E AND Latitude: 19°58'19.30" S Longitude: 116°20'56.51" E	
	<u>Area C – Spartan and WA-510-P</u> Latitude: 20°32'4.5" S Longitude: 115°14'52.9" E AND Latitude: 20°01'26.8" S Longitude: 116°18'34.9" E	
Permit Areas	Area A – WA-437-P, WA-438-P, WA-541-P (Commonwealth waters)	
	Area B – WA WA-1P, WA-209-P, WA-41-L (Commonwealth waters)	
	Area C – WA-33-R, WA-510-P (Commonwealth waters)	
Installation Type	N/A	
Water Depth	Area A – 35 to 110 m	N/A
	Area B – 50 to 65 m	
	Area C – 30 to 80 m	

Parameter	Description			Further Information
Worst-case Spill Scenarios	Scenario	Hydrocarbon	Worst case volume (m^3)	Section 6.1
	Area A			
	Surface diesel release (surface spill)	Marine Diesel Oil	329	
	Area B			
	Surface diesel release (surface spill)	Marine Diesel Oil	329	
	Area C			
	Surface diesel release (surface spill)	Marine Diesel Oil	329	
Hydrocarbon Properties	Marine Diesel Oil (MDO) Density kg/m^3 at 25°C = 829 Dynamic viscosity (cP) = 3.9 @ 25° C API Gravity = 37.6			**Appendix A**
Weathering Potential	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 hydrocarbons", which are unlikely to evaporate and will decay over time.			**Appendix A**
Protection Priorities	Montebello Islands, Barrow Island, Barrow-Montebello Surrounds			**Section 6.6**

2 First Strike Response Actions

For an oil spill to the marine environment, 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)).

Further response information contained within this OPEP is concerned primarily when the Santos Incident Management Team (IMT) is engaged for support.

For an oil spill to the marine environment the On-scene Commander (OSC) is to contact the Incident Commander (Incident Commander) in Perth via the on-call Duty Manager (as per below). The OSC is either the Santos Company Site Representative (if present) or the Vessel Master. This will be determined during the planning stages of the activity.

Response information contained within this OPEP is concerned primarily with a large scale (Level 2/3) hydrocarbon spill where the Perth-based IMT are engaged for support. Level 1 spills do not typically require the stand-up of the IMT for support, however on-site response actions to monitor the spill and regulatory requirements for reporting these spills still apply. 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.

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 (vessel-specific procedures, as applicable)	OSC/Vessel Master
Immediate	Control the source using site resources, where possible	Implement site source control procedures (Vessel SOPEP, as applicable)	OSC/Vessel Master
Within 30 minutes of incident being identified	Notify Santos Duty Manager	Verbal communication to Offshore Duty Manager's 's duty phone	OSC
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	OSC
Within 60 minutes	Gain situational awareness and begin onsite spill surveillance	Level 1 spills may only require use of onsite resources to conduct monitor and evaluate activities (e.g. vessel surveillance and tracking buoys). Refer Activate the Monitor and Evaluate Plan (**Section 10**).	OSC Incident Commander
Refer timeframes Go to **Section 7**	Make regulatory notifications within regulatory timeframes	Activate the External Notifications and Reporting Procedures Go to **Section 7**	Initial notifications by Environment/Safety Team Leads
Level 2/3 spills (in addition to actions above)			
Immediately once notified of spill (to Incident Commander)	Activate IMT, if required	Notify IMT	Duty Manager Incident Commander

When (indicative)	Activations		Who
	Objective	**Action**	
IMT Actions (0-48 hours)			
Within 90 minutes from IMT callout	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 Team Leader
Refer timeframes **Section 7**	Make regulatory notifications as required Notify and mobilise/put on standby external Oil Spill Response Organisations (OSROs) and Support Organisations, as required	Go to **Section 7**	Initial notifications by Environment/Safety Team Leads OSRO (Australian Marine Oil Spill Centre [AMOSC] and OSRL) activation by designated call-out authorities (Incident Commanders/Duty Managers)
Refer timeframes **Section 10**	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	Vessel surveillance (**Section 10.1**) Aerial Surveillance (**Section 10.2**) Tracking Buoys (**Section 10.3**) Oil spill Trajectory Modelling (**Section 10.4**) Satellite Imagery (**Section 10.5**) Initial Oil Characterisation (**Section 10.6**) Operational Water Quality Monitoring **(Section 10.8)** Shoreline and Coastal Habitat Assessment (**Section 10.9**)	IMT Operations Team Leader IMT Logistics/Supply Team Leaders IMT Environment Team Leaders

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**	IMT Operations Team Leader (Drilling Team Leader as appropriate to scenario) IMT Logistics/Supply Team Leaders
Activate on Day 1 for applicable scenarios Refer **Section 11**.	Reduce exposure of shorelines and wildlife to floating oil through mechanical dispersion	Go to **Section 11**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
Day 1	Identify environmental sensitivities at risk and conduct NEBA	Review situational awareness and spill trajectory modelling Review strategic NEBA and begin operational NEBA (**Section 6.7**)	IMT Environmental Team 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**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
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)	IMT Safety Team Leader
If/when initiated Refer **Section 12**	Protect identified shoreline protection priorities	Activate Shoreline Protection and Deflection Plan Go to **Section 12**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders IMT Environment Team Leader

When (indicative)	Activations		Who
	Objective	Action	
If/when initiated Refer **Section 14**	Prevent or reduce impacts to wildlife	Activate the Oiled Wildlife Response Plan. Go to **Section 14**	IMT Environment Team Leader IMT Operations Team Leader IMT Logistics/Supply Team Leaders
If/when initiated Refer **Section 16**	Assess and monitor impacts from spill and response	Activate the Scientific Monitoring Plan. Go to **Section 16**	IMT Environment Team Leader IMT Logistics/Supply Team Leaders IMT Operations Team Leader
If/when initiated	Clean-up oiled shorelines	Activate Shoreline Clean Up resources. Go to **Section 13**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
If/when initiated	Safely transfer, transport and dispose of waste collected from response activities	Activate the Waste Management Plan. Go to **Section 15**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders

When (indicative)	Activations		Who
	Objective	Action	
IMT Actions (48+ hours)			
Ongoing	+ For ongoing incident management – indicatively 48 + hours – a formal incident action planning process is to be adopted to continue with spill response strategies identified above. An Incident Action Plan (IAP) is to be developed for each successive operational period. + Santos will maintain control for those activities for which it is the designated Control Agency/Lead IMT. + Depending on the specifics of the spill AMSA and/or DoT may be relevant Control Agencies (refer **Section 4.2**). + Where another Control Agency has taken control of aspects of the response, Santos will provide support to that Control Agency. Santos's support to DoT for a State waters response is detailed in **Section 5.2.3**.		Control Agency IMT Santos to provide the following roles to DoT Maritime Environmental Emergency Coordination Centre (MEECC)/IMT for State waters response: IMT Liaison Officer Intelligence Support Officer Deputy Planning Officer Environmental Support Officer Public Information Support & Media Liaison Officer Deputy Logistics Officer Facilities Support Officer Deputy Finance Officer Deputy OSC (FOB)

3 Introduction

This document is the accompanying Oil Pollution Emergency Plan (OPEP) to the *Commonwealth Exploration Vessel Based Activity (VBA) Environment Plan (EP)* (*SO-91-BI-20011*) (referred to throughout this OPEP as the Commonwealth Exploration VBA EP) 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 Energy Ltd (Santos) proposes to conduct exploration drilling across three operational areas, all located in Commonwealth waters (**Figure 3-1**). As part of drilling preparatory work, vessel-based site surveys will be undertaken involving geophysical survey techniques to assess the shallow seabed soils' suitability to provide a safe foundation for a jack-up mobile offshore drilling unit (MODU). The survey activity ('the activity') will involve surveying the planned drilling locations and tie-in lines extending from the proposed drilling location to existing data points in the nearby area.

Refer to Section 2 of the *Commonwealth Exploration VBA EP (SO-91-BI-20011)* for details on the activity.

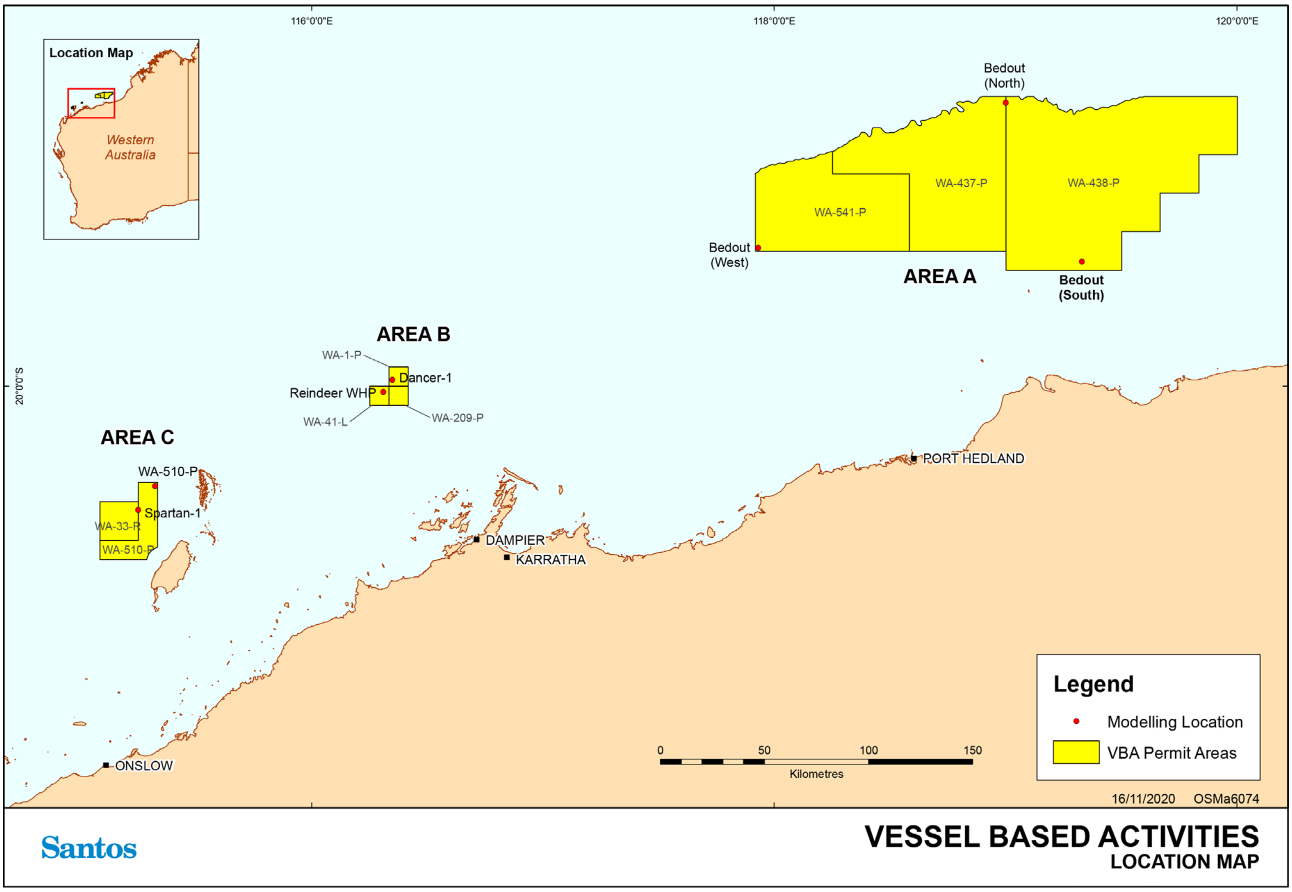

Figure 3-1: Schematic of the VBA EP operational areas

3.2 Purpose

The purpose of this Oil Pollution Emergency Plan (OPEP) is to describe Santos' response to a hydrocarbon spill during vessel-based activities within the three operational areas covered in the VBA EP.

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 (NatPlan) managed by the Australian Maritime Safety Authority (AMSA) and the WA State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE).

This OPEP is to be read in conjunction with the *Commonwealth Exploration VBA EP (SO-91-BI-20011)* 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 *Commonwealth Exploration VBA EP (SO-91-BI-20011)* and will remain valid for the duration of life of the EP. If improved preparedness measures are identified within this time frame the OPEP will be revised accordingly.

The response strategies outlined in this OPEP have been developed by Santos utilising risk assessments to identify credible worst case hydrocarbon spill scenarios, expected/calculated release rates, known information of hydrocarbon types and behaviour, and expected partitioning of the hydrocarbon within the marine environment with an estimate of the volume of persistent oil. This information has been modelled to give a theoretical zone of dispersion that is used to identify potential sensitive receptors and response strategies required to reduce the consequences of a spill to 'As Low As Reasonably Practicable' (ALARP). The response strategies are identified under a Net Environmental Benefit Assessment' (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 Commonwealth Exploration VBA EP (*SO-91-BI-20011*) covers three operational areas (**Figure 3-2**):

Area A – Bedout Basin

Operational Area A falls within three petroleum licences areas (WA-437-P, WA-438-P, WA-541-P), all of which are in Commonwealth waters. The nearest landmass[1] to Operational Area A is Eighty Mile Beach, located approximately 58 km to the southeast. Water depths in the operational area range from 35 m to 110 m

Area B – Reindeer and Dancer

Operational Area B falls within three petroleum licence areas (WA WA-1-P, WA-209-P and WA-41-L), all of which are in Commonwealth waters. The nearest landmass to Operational Area B is the Dampier Archipelago, located approximately 45 km to the south-southeast. Water depths in the operational area range from 50 m to 65 m.

Area C – Spartan and WA-510-P

Operational Area C falls within two petroleum licence areas (WA-33-R and WA-510-P), both of which are in Commonwealth waters. The nearest landmass to operational area C is Barrow Island, located approximately 7 km to the east. Water depths in the operational area range from 30 m to 80 m.

Section 3 of the Commonwealth Exploration *VBA EP (SO-91-BI-20011)* includes a comprehensive description of the existing environment. A summary of nearest regional features[1] and distances from Operational Areas A, B and C are provided in **Table 3-1**.

[1] Bedout Island and North Turtle Island Nature Reserve are located approximately 9 km south and 44 km south of Area A, however these are not considered to be key regional features.

Table 3-1: Distances from operational areas A, B and C to key regional features

Regional Feature	Distance from Area A	Distance from Area B	Distance from Area C
80 Mile Beach	58 km S	320 km E	435 km E
Ningaloo Marine Park (boundary) – State waters	458 km SW	276 km S	136 km SW
Montebello Islands Marine Park	262 km SW	72 km SW	10 km E
Ningaloo Reef proper	476 km SW	239 km SW	154 km SW
State/Commonwealth waters boundary	37 km S	35 km S	0 km
Muiron Islands Marine Management Area	437 km SW	254 km SW	117 km SW
Muiron Island South	452 km SW	269 km SW	131 km SW
Barrow Island	292 km SW	105 km SW	7 km E
Dampier Archipelago	156 km SW	45 km SW	120 km E
North West Cape (mainland WA)	471 km SW	287 km SW	149 km SW

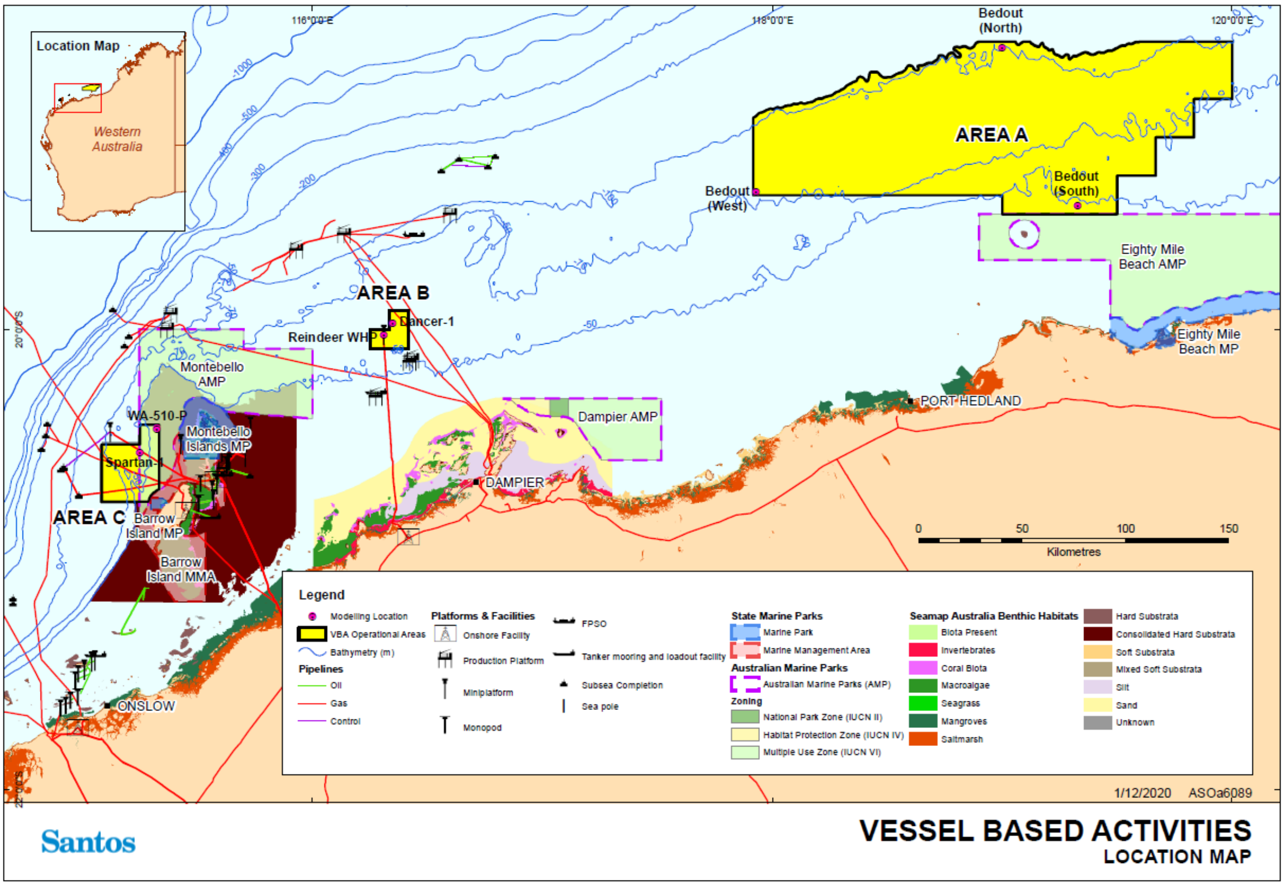

Figure 3-2: VBA EP location map and regional features

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 & Management Manual (SO-00-ZF-00025)
+ Berthing and Terminal Handbook (TV-22-IG-00067)
+ Offtake Operational & Pilotage Procedure (NV-91-IG-10010.03)
+ Incident Response Telephone Directory (SO-00-ZF-00025.020)
+ Refuelling and Chemical Management Standard (QE-91-IQ-00098)
+ Santos Source Control Planning and Response Guideline (DR-00-OZ-20001)
+ Oil Pollution Waste Management Plan (QE-91-IF-10053)
+ Oil Spill Response HSE Management Manual (SO-91-RF-10016)
+ 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)
+ Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).

Relevant Tactical Response Plans are made available within the ‘First Strike Resources’ folder within the Offshore Emergency Response on Santos intranet site.

4 Oil Spill Response Framework

4.1 Spill Response Levels

Santos uses a tiered system of incident response levels consistent with State and National incident response plans including the State Hazard Plan: Maritime Environmental Emergencies and the National Plan for Maritime Environmental Emergencies (NatPlan). 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

<table>
<tr><th colspan="2">Level 1</th></tr>
<tr><td colspan="2">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 onsite without the need to mobilise the Santos IMT or other external assistance.</td></tr>
<tr><td>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 Incident Response Team (IRT) and its resources.</td><td>Source of spill has been contained.
Oil is evaporating quickly and no danger of explosive vapours.
Spill likely to naturally dissipate.
No media interest/does not have an adverse effect on the public.</td></tr>
<tr><th colspan="2">Level 2</th></tr>
<tr><td colspan="2">An incident that cannot be controlled by the use of onsite resources alone and requires external support and resources to combat the situation; or
An incident that can be controlled onsite but which may have an adverse effect on the public or the environment.</td></tr>
<tr><td>Danger of fire or explosion.
Possible continuous release.
Concentrated oil accumulating in close proximity to the site or vessel.
Potential to impact other installations.</td><td>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.</td></tr>
<tr><th colspan="2">Level 3</th></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>Loss of well integrity.
Actual or potentially serious threat to life, property, industry.
Major spill beyond site vicinity.
Significant shoreline environmental impact.</td><td>Level 2 resources overwhelmed, requiring international assistance.
Level 3 resources to be mobilised.
Significant impact on local communities.
International media attention.</td></tr>
</table>

4.2 Jurisdictional Authorities and Controlling Agencies

During a spill response there will be both a Jurisdictional Authority and a Control Agency assigned to the oil spill incident for all spill response levels.

Definitions of Jurisdictional Authority and Control Agency are as follows:

+ Control Agencies: 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.

With respect to a hydrocarbon spill during vessel based activities within Operational Areas A, B and C, the relevant Jurisdictional Authority and Control Agency varies dependent upon the location of the oil pollution (Commonwealth or State waters), the nature of the incident (vessel based) and the spill response level (refer **Table 4-2**).

To aid in the determination of whether a spill is classed as a vessel spill, the following guidance is adopted:

+ A vessel is a ship at sea to which to which the *Navigation Act 2012* applies.

Table 4-2: Jurisdictional authorities and control agencies for VBA oil spill response

Role	Spill Level	State waters/shoreline oil pollution	Commonwealth waters oil pollution
		Vessel[2]	Vessel[2]
Control Agency	1	DoT	AMSA
	2/3	DoT	AMSA
Jurisdictional Authority	1/2/3	DoT	AMSA

4.3 Vessel Spills in Commonwealth Waters

For a vessel incident originating in Commonwealth Waters, the Jurisdictional Authority and Control Agency is AMSA. AMSA is the national shipping and maritime industry regulator and was established under the *Australian Maritime Safety Authority Act 1990*. AMSA manages the NatPlan on behalf of the Australian Government, working with State and the Northern Territory governments, emergency services and private industry to maximise Australia's marine pollution response capability.

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

Santos will be responsible for coordinating a first-strike response to a vessel based spill in Commonwealth waters until such time as AMSA takes over the role as Controlling Agency, at which time Santos would provide all available resources as a Supporting Agency.

4.4 Cross-jurisdictional Vessel Spills

For a large vessel spill (Level 2/3) that crosses Jurisdictions between Commonwealth and State waters, two Jurisdictional Authorities exist (AMSA for Commonwealth waters and DoT for State waters). Coordination of Control Agency responsibilities will be determined by DoT and AMSA, based on incident specifics with Santos providing first strike response and all necessary resources (including personnel and equipment) as a Supporting Agency.

5 Santos Incident Management

The Santos IMT (Perth) and Crisis Management Team (CMT) will be activated in the event of a Level 2/3 hydrocarbon spill regardless of the type of spill or jurisdiction. As outlined above, 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 Incident Command and Management Manual (ICMM) (SO-00-ZF-00025). The ICMM describe response planning and incident management that would operate under emergency conditions – describing how the Santos IMT operates and interfaces with the CMT and external parties.

The first priority of an escalating oil spill response to a Level 2/3 spill is the formation of an IMT and the 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 an incident within the Operational Areas includes:

+ Facility-based IRT
+ Santos IMT – Perth based to coordinate and execute responses to an oil spill incident
+ Santos CMT – to coordinate and manage threats to the company's reputation and to handle Santos corporate requirements as an operator in conjunction with the Perth Based Santos - Executive Vice President Offshore Oil and Gas (EVP Offshore)
+ other field-based command, response and monitoring teams for implementing strategies outlined within the OPEP.

The first priority of an escalating oil spill response is the formation of an IMT to establish a control centre. The establishment and involvement of the CMT will be dependent on the severity of the spill.

The Santos incident response organisational structure is defined in the Incident Command and Management Manual Planning (SO-00-ZF-00025), and shown in **Figure 5-1** for reference.

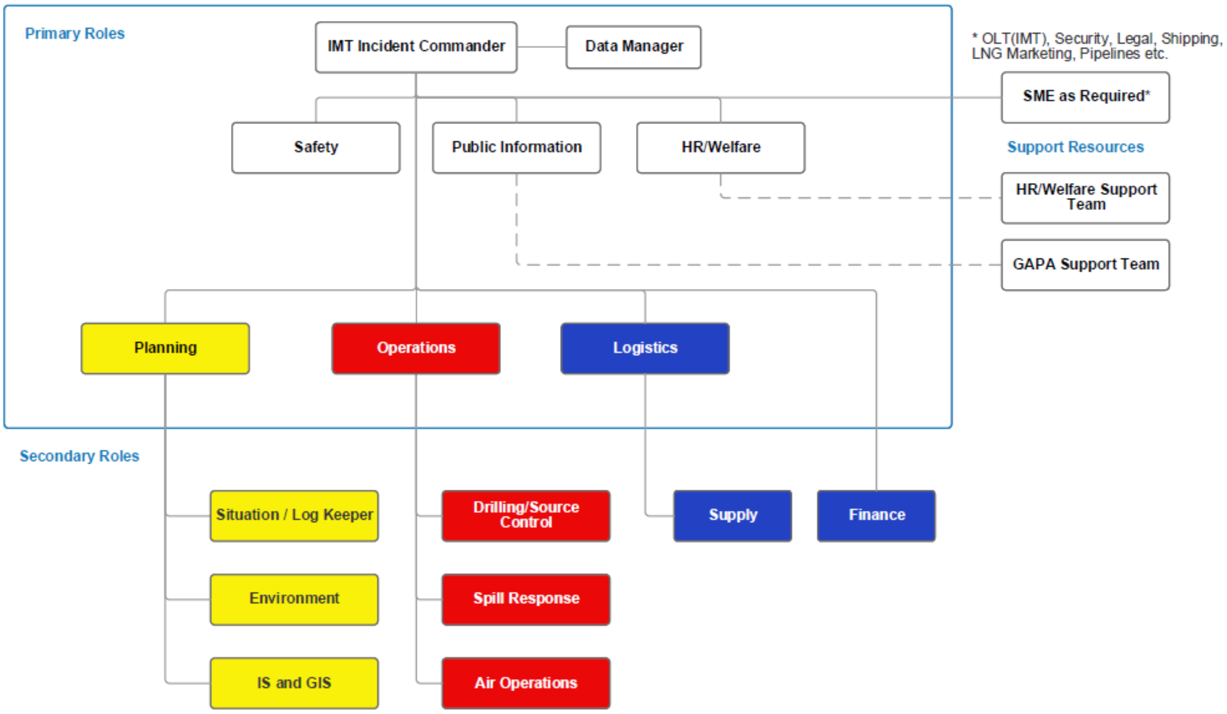

Figure 5-1: Santos Incident Management Team organisational structure

Note: For a Level 2/3 Petroleum Activity spills whereby DoT is involved as a Controlling 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 the DoT in providing spill response capability. Santos' expanded organisational structure for these situations is detailed in ***Section 5.2.3****.*

5.1 Roles and Responsibilities

The tables below 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**).

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 to the Santos IMT in a coordinated response, as outlined for reference in (**Table 5-4)**.

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

Santos CMT Role	Main Responsibilities
CMT Leader	+ Maintain contact with IMT or Issue Notification stakeholder until the CMT is fully functional. + Articulate the overall response priorities and required actions using the PEARL approach. + Consider response options to achieve priorities, including mitigating the potential worst-case scenario. + Determine Key Messages and Stakeholders, assigning Santos points of contact for each stakeholder. + Ensure CEO or delegate is engaged for all internal (staff) and external communications. + Confirm frequency of CMT reports and meetings and coordination with CEO, IMT and other stakeholders. + Consider how a change in the situation over time may alter the most likely and worst-case scenarios originally identified, and how this impacts response options and priorities. + Consider CMT requirements for the next phase of activity, allocating actions as appropriate.
Administrator – EHS & Governance	+ Provide location, time and meeting medium details (i.e telecon etc) to CMT members. + Work with the CMT Log Keeper to maintain an accurate CM Log with key situation details, meeting decisions/actions and next meeting time/location details. + Disseminate approved briefing material to personnel following CMT Leader's direction. + Liaise with Public Affairs/Safety & Security/Facilities on any reception, premises security or media/advisor briefing requirements. + Ensure role discipline of CMT representatives, monitoring action progress and any coordination. + At each CMT meeting summarise and record: – any change/handover in CMT representatives – the situation reviews and actions since last CMT meeting – any issues raised between meetings requiring escalation to or coordination with the CMT.

Santos CMT Role	Main Responsibilities
Duty Manager	+ With CEO agreement and appointment of a CMT Leader, assist with/oversee activation of the CMT. + Ensure the core CMT and specialist members are given details for the initial CMT meeting including location, time and meeting medium (i.e. telecon etc). + Where applicable contact IMT Leader or Issue Notification stakeholder and gain latest update for team. + Articulate the overall response priorities and required actions using the PEARL approach. Ensure ongoing monitoring for hidden or emerging risks. + Determine Key Messages and Stakeholders, assigning Santos points of contact for each stakeholder. + Ensure appropriate Legal Protocols are established on advice from CMT Legal. + Ensure CEO or delegate is engaged for all internal (staff) and external communications. + Consider how a change in the situation over time may alter the most likely and worst-case scenarios originally identified, and how this impacts response options and priorities.
Government & Public Affairs	+ Without delaying CMT attendance, gain advice from Government and Public Affairs teams on main and social media situation, government stakeholder requests and requirements, and immediate strategy. + Gain requirements from the CEO or delegate on strategy, timings, and media representation. + Follow the Crisis Management Process using the nominated support tools. + At initial CMT meeting, take the lead role setting out and updating the stakeholder communications plan. + Identify current and immediate messaging needs (i.e. Holding Statements, internal communications, industry advices, government notifications, media releases) and ongoing issues management. + Advise on Government and Public Affairs recommendations and other considerations to support company sustainability and resilience. + Advise on and coordinate the stakeholder management approach across all levels of Santos, including media monitoring and media inquiry. + Engage and oversee any specific asset or sub teams required for stakeholder management.

Santos CMT Role	Main Responsibilities
Risk & Audit	+ Advise on current and potential company risk issues. + Determine if additional specialists are needed. If so, coordinate and monitor their implementation (via the IMT Leader where an IMT is active) and keep the CMT updated. + Advise on Santos risk options and recommendations, other mitigation controls to company sustainability, and resilience requirements. + Monitor and assess cumulative risk consequences and potential exposures to Santos. + Engage and oversee any specific sub teams or specialists required for Risk and Audit support. + Between meetings, liaise with sub teams and specialist advisors to ensure an effective response. Ensure confidentiality and authorised comment is continually observed.
Safety and Security	+ Identify current and potential safety and security response, support or regulatory issues. + Determine if additional safety or security specialists are needed. If so, coordinate and monitor their implementation (via the IMT Leader where an IMT is active) and keep the CMT updated. + Advise on safety and security recommendations and other considerations to support company sustainability and resilience. + Advise on notifications to any safety or security related stakeholders, including mandatory regulatory advice or reports. + Monitor and assess safety and security consequences, advise on strategies and potential penalties and financial exposures to Santos. + Engage and oversee any specific sub teams or specialists required for Safety and Security support. + Between meetings, liaise with sub teams and specialist advisors to ensure an effective response. Ensure confidentiality and authorised comment is continually observed.

Santos CMT Role	Main Responsibilities
Human Resource Team Leader	+ Identify current and potential Human Resources (HR), People Support (PS) and Industrial Relations (IR) response, support (including incident site deployment) or regulatory issues. + Determine if additional HR, PS or IR specialists are needed. If so, coordinate and monitor their implementation (via the IMT where active with the respective IMT Leader) and keep the CMT updated. + Advise on and coordinate the personnel and next of kin communication approach across all levels of Santos with support from the Government and Public Affairs representative. + Advise on HR, PS and IR recommendations and other considerations to support company sustainability and resilience. + Monitor and report on any casualty condition, movement and health tracking to support injured parties (staff, contractors, and community as applicable). + Advise and coordinate management of HR, PS and IR stakeholders (via the IMT Leader where an IMT is active), including emergency services, union representation. + Monitor any HR or IR consequences, advise on strategies and potential penalties and financial exposures to Santos. + Engage and oversee any specific asset or sub teams used for HR, PS and IR stakeholder management. + Between meetings, liaise with asset and sub teams and specialist advisors to ensure an effective response. Ensure confidentiality and authorised comment is continually observed.
Legal & Company Secretariat	+ Identify current and potential legal and company secretary issues. + Determine if additional legal specialists are needed. If so, coordinate and monitor their implementation (via the IMT Leader where an IMT is active) and keep the CMT updated. + Advise on Legal Professional Privilege matters for the CMT and coordinate with other groups (including IMT representation) to ensure company information and personnel are appropriately advised. + Advise the CMT, asset and sub teams about contractual obligations, including Joint Venture and supply agreements, as required. + Advise on legal and company secretariat recommendations and other considerations to support company sustainability and resilience. + Advise on notifications to regulatory or legal related stakeholders, including mandatory advice or reports. + Monitor and assess legal consequences, advise on strategies and potential penalties and financial exposures to Santos.
Additional CMT support available as required: + Environment and Land Access + Assets and Operations + Engineering and Technical + Exploration + Finance	

Santos CMT Role	Main Responsibilities
+ Information Systems + Insurance + Marketing and Trading + Treasury + Commercial and Procurement	

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

Santos Management/ IMT Role	Main Responsibilities
Executive Vice President - Offshore Oil and Gas	+ Liaise with government and media. + Authorise overall strategic objectives set by the Incident Commander. + Liaise with Designated Authorities in the event of a Level 3 Incident.
L3 Senior Manager	Division SME activated as required to: + Advise on ongoing legal aspects. + Manage insurance issues. + Review all external information for approval via Santos CMT (JV Partners, Santos, customers, etc.) and manage briefings. + Validate media and holding statements releasable information with regards to personnel matters. + Work with CMT Public Affairs and HR on content of internal statements to staff. + Put EAP on alert if appropriate. + Work with Police welfare person or doctors as required. + Manage all financial commitments through the response. + Advise EVP Offshore of financial commitments in the response. SME = Finance, Legal G&PA, Human Resources, JV coordinator/liaison.
Incident Commander	+ Coordinate all support in accordance with the Incident Response Plan (IRP) and/or activity specific Oil Spill Contingency Plan or Oil Pollution Emergency Plan. + Set the response objectives and strategic direction. + Oversee the development and implementation of Incident Action Plans. + Oversee implementation of MoUs and contracted support for 'mutual aid'. + Ensure co-ordination with external organisations/police, etc. + Prepare and review strategic and tactical objectives with the EVP Offshore. + Liaise with the EVP Offshore and provide factual information. + Set response termination criteria in consultation with regulatory authorities.

Santos Management/ IMT Role	Main Responsibilities
Planning Team Leader	+ Collect and document situational awareness information of the incident. + Develop, document, communicate and implement Incident Action Plans to achieve incident objectives. + Determine the status of action/s or planned activities under the Incident Action Plans and assess and document performance against the objectives. + Assess long term consequences of incident and plan for long term recovery. + Manage the Geographic Information System (GIS) Team in a response.
Operations Team Leader	+ Coordinate operational aspects of Incident Response. + Provide the key contact for OSCs. + Liaise with contractors or third parties. + Mobilise additional Santos staff and external experts to form Technical Support Team. + Assist Planning Team Leader with overall general plan preparation and preparation of Incident Action Plans. + Implement Incident Action Plans. + Manage field response teams and activities.
Public Information /Government & Public Affairs	+ Manage all communication with media. + Liaise with government. + Prepare media releases for nominated spoke person (CM or EVP). + Brief all Santos personnel appearing before the media. + Manage the Telephone Support Team. + Ensure timely release of communications briefs to the Telephone Support Team.
Logistics Team Leader	+ Mobilise response equipment, helicopters, vessels, supplies and personnel. + Provide transport and accommodation for evacuated personnel. + Oversee the implementation of the Waste Management Plan throughout a Tier 2 or Tier 3 oil spill response. + Liaise with the Supply Team to activate supply contracts and arrange procurements. + Coordinate authorities for search and rescue.
Supply Team Leader	+ Arrange fast track procurement. + Activate supply contracts as required. + Implement and maintain Cost Tracking System to enable the tracking of all costs associated to the response of the incident.

Santos Management/ IMT Role	Main Responsibilities
Environmental Team Leader	+ Manage notification to Designated Environmental Authorities and liaise as required. + Assist in the development of Incident Action Plans. + Advise of the Net Environmental Benefit Analysis of oil spill response strategies and tactics. + Oversee the implementation of scientific monitoring programs in an oil spill response. + Provide liaison for implementation of the WA Oiled Wildlife Response Plan in an oil spill response.
HR/Welfare Team Leader	+ Obtain personnel status involved in the incident. + Review Persons on Board (POB) lists and clarify accuracy through Safety Team Leader. + Obtain list of Contactor Companies involved in the incident and obtain Third-Party Contractor contact to advise of situation and safety of personnel when appropriate. + Liaise with 3rd-Party Contractor contact regarding their personnel and organise handover. + Obtain employee's emergency contact list (NOK) to advise of situation and safety of personnel when appropriate. + Work with Logistics Team Leader to arrange transport for affected families to hospitals, etc. + Assist with arrangements through EAP to support families/employees. + Arrange NOK notifications for affected personnel (excluding Police managed fatalities). + Determine NOK assistance required i.e. family travel to hospital, child support, etc. + Arrange for dedicated management support for families and next-of-kin, if appropriate. + Arrange EAP counselling at airports and homes where required – HR personnel to attend where possible.
Safety Team Leader	+ Manage notification to Designated Safety Authorities and liaise as required. + Assist in the development of Incident Action Plans. + Oversee the development and implementation of incident Safety Management Plans as required. + Work with the Welfare Team Leader to support personnel safety.
Computing and Communications Leader	+ Set up computing and communications in the IMT and IMT OLT Centres. + Establish video monitoring between IMT and IMT OLT. + Set up the incident response telephone room upon request.
Telephone Support Team	+ Liaise with CMT Government/Media advisor for internal and external communication releases. + Receive enquiries and provide information to the IMT. Forward enquiries to the appropriate group within the IMT and CMT G&PA teams. + Log phone messages and arrange for calls to be returned.

Santos Management/ IMT Role	Main Responsibilities
Data Manager	+ Ensure IMT resources are in place and functional in the ICC. + Oversee the setting up of communications systems by the Computing and Communications Leader. + Distribute manuals, contact lists and supporting information to IMT personnel. + Record and collect all information associated with the response to the incident. + Maintain filing system for Incident Response.
GIS	+ Manage and keep up-to-date facility and asset drawings, data sets, and photos in the 'GIS in IMT Database'. + Manage and keep up-to-date environmental features and sensitivity data sets in the 'GIS in IMT Database'. + Manage and keep up-to-date marine maps in the 'GIS in IMT Database'. + Provide IMT with quick access to up-to-date drawings and data sets in the ICC. + Provide software system to IMT that allows tactical response mapping overlays on facility drawings and area maps.

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

Field-Based Position	Main Responsibilities
On-scene Commander (OSC)*	+ Command the onsite response to incidents, including oil spills, using onsite resources. + Notify the Perth based Incident Commander of Level 2/3 incidents, including oil spills, requiring offsite support. + Single point of communication between facility/sites and IMT.
Off-Asset OSC	+ Coordinate the field response as outlined in the Incident Action Plan developed by the IMT. + Command a Forward Operating Base (FOB) for the coordination of resources mobilised to site.
Off-Asset Oil Spill Response Teams	+ Undertake oil spill response activities as defined in Incident Action Plans and Oil Pollution Emergency Plans.
Oiled Wildlife Response Team	+ Respond to oiled wildlife incidents to minimise the impacts to wildlife. + Refer to the Western Australia Oiled Wildlife Response Plan for detailed descriptions of roles and responsibilities within the Oiled Wildlife Response Team.
Scientific Monitoring Teams	+ 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.

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

Table 5-4: Department of Transport roles embedded within the Santos IMT

DoT roles embedded within Santos IMT	Main Responsibilities
DoT Liaison Officer (prior to DoT assuming role of Control Agency) Deputy Incident Controller – State waters (after DoT assumes Controlling Agency)	+ Provide a direct liaison between the Santos IMT and the MEECC. + Facilitate effective communications between DoT's SMEEC/Incident Controller and Santos IMT appointed Incident Commander. + Provide enhanced situational awareness to DoT of the incident and the potential impact on State waters. + Assist in the provision of support from DoT to Santos. + Facilitate the provision of technical advice from DoT to Santos Incident Commander as required.
Media Liaison Officer	+ Provide a direct liaison between the Santos Media team and DoT IMT Media team. + Facilitate effective communications and coordination between the Santos and DoT media teams. + Assist in the release of joint media statements and conduct of joint media briefings. + Assist in the release of joint information and warnings through the DoT Information & 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 State Maritime Environmental Emergency Coordination Centre/Department of Transport (DoT) IMT

Santos roles embedded in the State MEECC/DoT IMT	Main Responsibilities
IMT Liaison Officer	+ Provide a direct liaison between the Santos IMT and the State MEECC. + Facilitate effective communications and coordination between the Santos IMT Leader and the State Maritime Environmental Emergency Coordinator (SMEEC). + Offer advice to SMEEC 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 IMT. + Facilitate the provision of relevant mapping originating from the Santos IMT.

Santos roles embedded in the State MEECC/DoT IMT	Main Responsibilities
Deputy Planning Officer	+ As part of the DoT Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub plans. + Facilitate the provision of relevant IAP and sub plans from the Santos IMT. + Assist in the interpretation of the Santos OPEP from Santos. + Assist in the interpretation of the Santos IAP and sub plans from the Santos IMT. + Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the Santos IMT. + Assist in the interpretation of Santos' existing resource plans. + Facilitate the provision of relevant components of the resource sub plan originating from the DoT IMT to the Santos IMT. + (Note this individual must have intimate knowledge of the relevant Santos OPEP and planning processes).
Environment Support Officer	+ As part of the Intelligence Team, assist the Environment Coordinator in the performance of their duties in relation to the provision of environmental support into the planning process. + Assist in the interpretation of the Santos OPEP and relevant 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	+ 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 through the Contact Centre to the Santos IMT.

Santos roles embedded in the State MEECC/DoT IMT	Main Responsibilities
Deputy Logistics Officer	+ As part of the Logistics Team, assist the Logistics Officer in the performance of their duties in relation to the provision of supplies to sustain the response effort. + Facilitate the acquisition of appropriate supplies through Santos's 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 disposal of waste through the Santos's existing private contract arrangements related to waste management and in line with legislative and regulatory requirements. + 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's existing OSRL, AMOSC and private contract arrangements. + Facilitate the communication of financial monitoring information to the 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.

Santos roles embedded in the State MEECC/DoT IMT	Main Responsibilities
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's Forward Operations Base/s (FOB/s) and the DoT FOB. + Facilitate effective communications and coordination between Santos Division Commander and the DoT Division Commander. + Offer advice to the DoT Division Commander on matters pertaining to Santos incident response policies and procedures. + Assist the Safety Coordinator deployed in the FOB in the performance of their duties, particularly as they relate to Santos employees or contractors. + Offer advice to the Safety Coordinator deployed in the FOB on matters pertaining to Santos safety policies and procedures.

5.2 Regulatory Arrangements and External Support

5.2.1 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.

5.2.2 Australian Maritime Safety Authority

The Australian Maritime Safety Authority (AMSA) is the designated Control Agency for oil spills from vessels within Commonwealth jurisdiction.

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)).

An 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 (NatPlan), Australia's key maritime emergency contingency and response plan. All resources under the NatPlan 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.

5.2.3 Western Australian Department of Transport

In the event that a Level 2/3 Marine Oil Pollution Incident enters, or has potential to enter, State waters, the HMA (DoT Marine Safety General Manager or proxy) will take on the role as the State Maritime Environmental Coordinator (SMEEC) and DoT will take on the role as a Control Agency.

Santos will notify the DoT Maritime Environmental Emergency Response (MEER) unit as soon as reasonably practicable (within two hours of spill occurring) of such an incident. On notification, the HMA will activate their MEECC and the DoT IMT.

For facility 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 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 within DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements 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 within DoT's *Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements* 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 (JSCC) will be established. The JSCC will be jointly chaired between the SMEEC 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 (refer **Section 5.1**) and operational personnel to assist with those response strategies where DoT is the Lead IMT. Santos' CMT Liaison Officer and the Deputy Incident Controller are to attends the DoT Fremantle ICC as soon as possible after the formal request has been made by the SMEEC. 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 SMEEC.

Figure 5-2 shows the organisational structure of Santos incident management personnel within Santos IMT and embedded within DoT's MEECC/IMT.

Figure 5-3 shows the overall cross jurisdictional organisational structure referenced from the SHP-MEE.

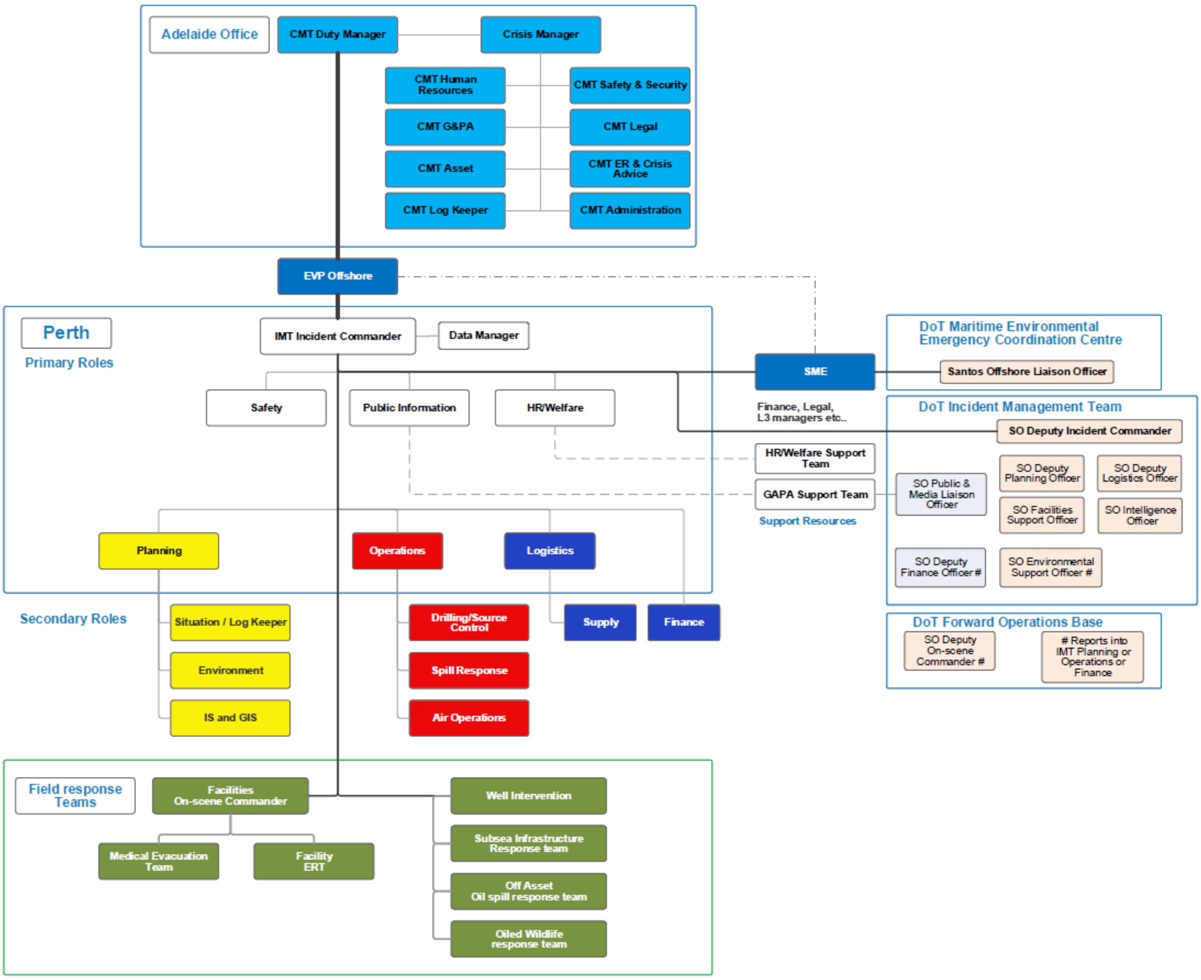

Figure 5-2: Santos cross jurisdictional incident management structure for Commonwealth waters Level 2/3 facility oil pollution incident entering State waters

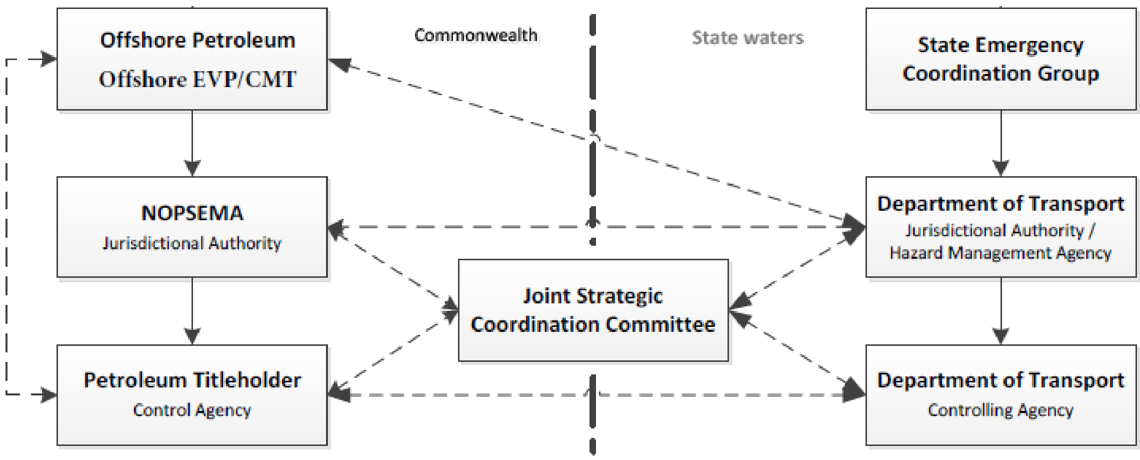

Figure 5-3: Overall control and coordination structure for offshore petroleum cross-jurisdiction incident

5.2.4 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) 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 State Maritime Environmental Emergency Coordinator 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.

5.2.5 Oil Spill Response Limited

Through an associate membership, Santos has access to spill response services from Oil Spill Response Limited (OSRL) with offices in Perth, Singapore, UK and at other various locations around the world. In the event of a Level 2/3 response, Santos could access OSRL's international personnel, equipment and dispersants, primarily through OSRL's Singapore stockpile, 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 (SLA). Santos also has access to additional dispersant stockpiles held by OSRL through a Global Dispersant Stockpile (GDS) Supplementary Agreement.

5.2.6 Department of Industry, Science, Energy and Resources

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). DSIR 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 OPICC, Liaison Officer/s will be deployed from DISER to the Petroleum Titleholders IMT.

For incidents that are classified at a greater level that 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 OPICC will not be convened, although DISER will remain as the lead agency.

5.3 External Plans

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
- NatPlan - 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.
- 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 (available online: DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements).
- Shipboard Oil Pollution Emergency Plans (SOPEP)
  - Under 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.
- Western Australia Oiled Wildlife Response Plan (WAOWRP)
  - 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. The Pilbara Region Oiled Wildlife Response Plan is the relevant regional plan for OWR associated with VBA operations.
- Oil Spill Response Limited (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.

5.4 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 Controlling Agencies (e.g. DoT) and third party spill response service providers.

5.5 Training and Exercises

5.5.1 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 IMT positions

IMT Role	Exercise	Training
Incident Commander Operations/Drilling Team Leader	One Level 2 exercise annually or three Level 2 desktop exercises annually	+ PMAOMIR320 + PMAOMIR418 + AMOSC – IMO3 Oil Spill Command & Control
Planning Team Leader Logistics Team Leader Environmental Team Leader		+ PMAOMIR320 + AMOSC – IMO2 Oil Spill Management Course
Safety Team Leader Supply Team Leader GIS Team Leader Data Manager HR/Welfare Team Leader		+ PMAOMIR320 + AMOSC – Oil Spill Response Familiarisation Training

5.5.2 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 Incident Response Teams	Present at Devil Creek, Varanus Island and Ningaloo Vision Facilities for first strike response to incidents	Internal Santos training and exercises as defined in each facility's Incident Response Plan OSC to have AMOSC – Oil Spill Response Familiarisation Training.	One IR team per operational facility per shift
Santos Aerial Observers	Aerial surveillance of spill Deployed by IMT in the aerial surveillance aircrafts	AMOSC – Aerial Surveillance Course (refresher training undertaken tri-annually)	7
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 Min. 84 Max. 140 (incl. Santos)
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
AMOSC Oil Spill Response Specialists	Professionals, providing technical, incident management and operational advice and assistance available under Santos-AMOSC contract	As per AMOSC training and competency matrix	8
Oiled Wildlife Response Roles (Level 4)	Refer OPEP **Section 14** and **Appendix M**		

Responder	Role	Training	Available Number
Monitoring Service Provider: Monitoring Coordination Team (MCT) and SMP Teams	Monitoring Coordination Team (MCT) SMP 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 SMP 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		

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 Controlling Agency:

+ National Plan: National Response Team (NRT) – Trained oil spill response specialists, including aerial observers, containment and recovery crews, and shoreline clean-up personnel, deployed under the direction of AMSA and the IMT in a response. The NRT is trained and managed in accordance with the National Response Team Policy, approved by the National Plan Strategic Coordination Committee (AMSA, 2013b).
+ 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. 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.

5.5.3 Response Testing

Following acceptance of an OPEP, notification arrangements of the plan are tested through a communications test to all external agencies and companies with roles defined within the plan. The communications tests are repeated annually for activities that extend longer than 1 year.

IMT members undertake workshops and exercises as outlined within the Incident and Crisis Management Training and Exercise Plan (QE-92-HG-10001) to clarify and familiarise themselves with their respective roles and responsibilities within OPEPs and other emergency plans. Learning aids are also introduced through these workshops to assist improvement of capability for the personnel to perform the functions of their role. Santos conducts IMT desktop and activation exercises using emergency scenarios across its main operating facilities on the North West Shelf or a drilling activity. An oil spill incident scenario is used for the activation exercise once per year. Both safety and oil spill incidents test the chain of command of the Santos response system, communications and notification with external parties, communication processes between office and facility, and field response tactics.

Testing of key response provider arrangements is 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.

Field deployment tests are undertaken by Santos as a sole responder and through Santos' involvement in multi-operator response deployment exercises.

5.5.4 Testing Schedule

Oil spill specific training, exercises, workshops and tests are detailed in the Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001). Once completed, records of exercises and workshops are entered into the Santos Training and Induction Database (Learning Management System). Key actions arising from exercises are recorded and tracked through the Santos Action Tracking System. Progress of training, exercise and workshop completion against the schedule is tracked and reported against on a monthly basis.

The Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001) is reviewed and revised annually.

5.5.5 Oil Spill Response Audits

Oil spill response audits will follow the Santos Assurance Management Standard (SMS-MS15.1) and are scheduled as per the Santos Assurance Schedule. Audits will assist in identifying and addressing any deficiencies in systems and procedures. At the conclusion of the audit, any opportunities for improvement and corrective actions required (non-conformances) will be formally noted and discussed, with corrective actions developed and accepted. In some instances, 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 of this audit 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 oil pollution emergency plans.

The deployment readiness and capability of OSRL's oil spill response equipment and personnel in Singapore are audited every two years. The intent of this audit is to provide assurances to Santos of OSRL's ability to respond to an oil spill incident as per its service level agreement (SLA).

The objectives and frequency of oil spill response testing and auditing relevant to VBA operations oil spill response are summarised in **Table 5-8**.

Table 5-8: Oil spill response testing arrangements

Exercise	Objective	Frequency	Recording and review
Communication test	To test all communication and notification processes to service providers and regulatory agencies defined within the OPEP.	Required for every approved OPEP. When response arrangements have changed. At least annually.	Any results of the test are recorded in a Test Report. Corrections are updated within the Incident Response Telephone Directory (SO-00-ZF-00025.020).
IMT workshops	To refresh IMT roles and responsibilities and provide familiarisation with OPEP processes and arrangements.	As per Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).	All workshops undertaken are recorded in Santos' Learning Management System.
OPEP desktop and activation exercise	<u>Desktop Exercise</u> To familiarise IMT with functions and process in response to a simulated oil spill scenario. <u>Activation Exercise</u> To activate full IMT in response to oil spill scenario and test arrangements contained within OPEP.	As per Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001) Minimum of one oil spill response activation oil spill exercise per year.	All exercises undertaken are recorded in Santos' Learning Management System. Key recommendations are recorded are tracked in Santos' Action Tracking System.
Response arrangement tests	Tests of response arrangements outlined within the OPEP either as part of desktop/activation exercises or as standalone desktop tests. Response arrangement tests to include testing of OPEP response timeframes.	As per Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001)..	Test reports are recorded if not already included within reports for IMT desktop/activation exercises or field deployment exercises. Key recommendations are recorded are tracked in Santos' Action Tracking System.

Exercise	Objective	Frequency	Recording and review
Equipment deployment exercises/tests	To focus on Santos' deployment capability. To inspect and maintain the condition of the Santos oil spill response equipment. To maintain training of field response personnel.	When new response equipment is added. As per Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001). The following Santos-owned equipment is inspected and/or tested: + tracker buoys + offshore boom/nearshore boom + power packs + vessel dispersant spray systems.	Reports are generated for exercises and recorded in Santos' Learning Management System. Key recommendations are recorded are tracked in Santos' Action Tracking System. Tracker Buoy tests are recorded.
AMOSC audit	To test deployment readiness and capability of AMOSC.	Every two years.	Undertaken by two of AMOSC's participating members and the audit report made available to members.
OSRL audit	To test deployment readiness and capability of OSRL in Singapore.	Every two years.	Undertaken by Santos or in coordination/ consultation with other member company. Recommendations provided to OSRL for action and close-out.

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 vessel based activities. Of the credible spill scenarios identified in the *Commonwealth Exploration VBA EP (SO-91-BI-20011)*, a sub-set 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 VBA operations.
+ 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**. Detail on the derivation of these maximum credible spills is provided within the *Commonwealth Exploration VBA EP (SO-91-BI-20011)*.

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 vessel based activity

Worst-case credible spill scenario	Hydrocarbon type	Maximum credible volume released (m^3)	Release duration	Maximum extent of surface hydrocarbons >1g/m^2
Surface diesel release (surface spill)	Marine Diesel Oil	329	0.5 hours	~200 km

6.2 Response Planning Thresholds

Environmental impact assessment thresholds are addressed in Section 7.5 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 are shown 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 (refer to **Appendix O**).
>50	+ Estimated minimum floating hydrocarbon threshold for containment and recovery and surface dispersant application*.
>100	+ Estimated floating hydrocarbon threshold for effective containment and recovery and surface dispersant application*. + Estimated minimum shoreline accumulation threshold for shoreline clean-up.

** Containment and recovery and surface dispersant application are not applicable spill response strategies under this OPEP*

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 less than 50 g/m^2.

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50 to 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 to 3 (EMSA, 2010).

6.3 Stochastic Spill Modelling Results

Table 6-3 presents the spill modelling results at Protection Priority locations for selected worst-case scenarios only. All scenarios were modelled using a stochastic approach running multiple simulations (150 simulations) across all seasons using a number of unique environmental conditions sampled from historical metocean data.

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 given there are limited response strategies that will reduce subsurface impacts.

Refer to Section 7.5 of the EP for further description on selection of oil exposure values presented in **Table 6-3**.

Table 6-3: Worst-case spill modelling results for vessel based activity

Location	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
Vessel collision with third-party vessel and surface spill (MDO) of 393 m³ over 0.5 hours						
Area A – Bedout Basin West (Latitude: 19°24'08.7" S/Longitude: 117°55'44.6" E)						
Clerke Reef MP	1.3	13.7	NC	NC	NC	NC
Area A – Bedout Basin North (Latitude: 18°46'32.1" S/Longitude: 118°59'55.9" E)						
Imperieuse Reef MP	0.7	9.4	0.7	9.4	1.6	2.8
Area A – Bedout Basin South (Latitude: 19°27'40.9" S/Longitude: 119°19'42.3" E)						
Bedout Island	17.3	0.8	6.7	0.8	52.8	1.4
Eighty Mile Beach	4.0	6.4	2.0	6.4	1.4	4.2
Port Hedland Eighty Mile Beach	2.7	2.6	1.3	2.6	1.6	2.8
Area B – Dancer (Latitude: 19°58'19.30" S/Longitude: 116°20'56.51" E)						
Barrow Island	2.7	4.8	NC	NC	NC	NC
Montebello Islands	2.0	6.6	0.7	6.6	152.9	25.5
Dampier Archipelago	1.3	2.5	0.7	2.5	0.6	1.4
Southern Islands Coast	1.3	5.5	NC	NC	NC	NC
Northern Islands Coast	0.7	5.5	NC	NC	NC	NC
Area B – Reindeer (Latitude: 20°01'26.8" S/Longitude: 116°18'34.9" E) - *No shoreline contact at thresholds*						
Area C – WA-510-P (Latitude: 20°25'52.1" S/Longitude: 115°19'21.1" E)						

Location	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
Montebello Islands	16.0	0.6	9.3	0.6	197.4	9.9
Barrow Island	10.7	1.1	4.7	1.1	188.1	19.8
Southern Islands Coast	7.3	2.6	NC	NC	NC	NC
Muiron Islands	6.0	4.6	0.7	4.8	1.4	5.7
Ningaloo Coast North	1.3	4.3	0.7	4.5	0.6	2.8
Lowendal Islands	0.7	7.0	0.7	7.0	1.4	1.4
Thevenard Island	0.7	9.2	NC	NC	NC	NC
Area C – Spartan (Latitude: 20°32'4.5" S/Longitude: 115°14'52.9" E)						
Montebello Islands	14.0	0.8	11.3	0.8	176.9	9.9
Barrow Island	12.7	1.1	4.7	1.1	144.6	9.9
Southern Islands Coast	5.3	2.5	0.7	2.5	0.6	2.8
Muiron Islands	5.3	4.0	NC	NC	NC	NC
Ningaloo Coast North	2.7	4.5	0.7	9.9	18.2	21.2
Dampier Archipelago	0.7	14.2	0.7	14.2	2.5	5.7
Thevenard Islands	0.7	5.9	NC	NC	NC	NC

6.4 Deterministic Modelling

No deterministic modelling was undertaken. Stochastic modelling is considered suitable to inform the response strategies, given responses to surface hydrocarbons are limited to mechanical dispersion for MDO.

6.5 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 (**Sections 6.3** and **6.4**) the following spill response strategies have been assessed as potentially applicable for combatting a spill (**Table 6-4**).

Note: The information contained in **Table 6-4** 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 6-4: Evaluation of applicable response strategies

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy MDO	Considerations
Source Control	Spill kits	✔ 1	Relevant for containing spills that may arise on board a vessel.
	Secondary containment	✔ 1	Relevant for spills that may arise due to stored hydrocarbons, and from spills arising from machinery and equipment on board 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 marine environment.
	Shipboard Oil Pollution Emergency Plan (SOPEP)	✔ 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 cargo via transfer to another storage area on-board 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.
In-Situ Burning	Controlled burning of oil spill	X	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 MDO	Considerations
Monitor and Evaluate Plan (Operational Monitoring)	Vessel surveillance	✔ 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	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	Can be implemented rapidly – four Fastwave buoys held on Varanus Island, six Fastwave buoys held in Dampier Supply Base. Two metocean buoys available in Exmouth Freight and Logistics. 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).

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy MDO	Considerations
	Trajectory Modelling	✔ 1	Can be implemented rapidly. Predictive - provides estimate of where the oil may go, which can be used to prepare and implement other responses. No additional field personnel required. Not constrained by weather conditions. Can predict floating, entrained, dissolved and stranded hydrocarbon fractions. May not be accurate. Requires in-field calibration.
	Satellite Imagery	✔ 1	Can work under large range of weather conditions (e.g. night time, cloud cover, etc). Mobilisation likely to be >24 hours. Requires processing. May return false-positives.
	Operational Water Quality Monitoring	✔ 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.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy MDO	Considerations
	Shoreline and Coastal Habitat Assessment	✔ 1	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	X	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 marine diesel as it has a low additional benefit of increasing the dispersal rate of the spill while introducing the potential for increased impacts.
	Aerial Application	X	
Offshore Containment and Recovery	Use of offshore booms/skimmers or other collection techniques deployed from vessel/s to contain and collect oil.	X	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.
Mechanical Dispersion	Vessel prop-washing	✔ 2	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.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy MDO	Considerations
Protection and Deflection	Booming in nearshore waters and at shorelines	✔ 2	Modelling shows <20% probability of shoreline accumulation at >10g/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 high priority areas for protection. 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 impact from marine diesel.
Shoreline clean-up	Activities include physical removal, surf washing, flushing, bioremediation, natural dispersion	✔ 2	Modelling shows <20% probability of shoreline accumulation at >10g/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.	✔ 2	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
		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	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.

6.6 Identify Protection Priority Areas and Initial Response Priorities

Combined spill modelling results were used to predict the Environment that may be Affected (EMBA) for VBA operations (refer Section 3.1 of the Commonwealth Exploration VBA EP). 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 VBA operational spill) for which detailed oil spill risk assessment has been conducted (refer Section 7.5.5.3 of the Commonwealth Exploration VBA EP). From these Hot Spot areas, protection priority areas for spill response have been identified (as per Section 7.5.5.3 of the Commonwealth Exploration VBA EP). Protection priority 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.

Table 6-4 lists the key sensitivities and associated locations within the protection priority areas identified for the worst case spill scenario. 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 6-5**. 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.

For example, for an MDO spill at Area C (WA-510-P), Montello Islands has the shortest time to shoreline contact (modelled to be 0.6 days) and highest shoreline loadings of all protection priority areas. Therefore, the response priority for this scenario would be to protect the highest ranked sensitivities, being Mangroves (widespread, present in lagoons and Stephenson Channel), turtles (nesting seasons higher priority and listed in **Table 6-5**) and migratory birds (significant nesting, foraging and resting areas higher priority as listed in **Table 6-5**). As the spill progresses, additional protection priority areas are likely to be impacted, however, modelling predicts time to impact ranges from 1.1 days at Barrow Island to 9.9 days at Ningaloo Coast North. This allows the IMT and response teams time to source additional resources to protect these key sensitivities, so the initial response priority is lower as the time to impact extends and loadings decrease.

Table 6-5: Initial response priorities during a surface MDO release (surface spill)

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[3]	DoT Ranking (Dissolved oil)[3]	Key locations	Relevant key periods	Maximum time-averaged oil ashore (m^3) >100 g/m^2	Minimum arrival time (days)	Initial response priority
Area B and Area C								
Montebello Islands	Mangroves	3	3	Widespread and present in lagoons. Important stands in Stephenson Channel	N/A	197	0.6	Medium
	Turtles – loggerhead (Endangered) and green (Vulnerable) (significant rookeries); hawksbill (Vulnerable), flatback (Vulnerable) turtles	4	3	Northwest and Eastern Trimouille Islands (hawksbill) Western Reef and Southern Bay at Northwest Island (green)	Turtle nesting and breeding Nov-Mar with peak in late Dec/early Jan			Medium
	Marine mammals Pygmy blue whale (Vulnerable) and humpback whale (Vulnerable) migration area	3	2	N/A	Pygmy blue whale migration: Apr to Aug Humpback whale migration: Jun to Jul			Low

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

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[3]	DoT Ranking (Dissolved oil)[3]	Key locations	Relevant key periods	Maximum time-averaged oil ashore (m^3) >100 g/m^2	Minimum arrival time (days)	Initial response priority
	Birds Migratory and threatened seabirds – at least 14 species Significant nesting, foraging and resting areas	3	2	Widespread	Nesting: Sep to Feb			Medium
	Coral and other subsea benthic primary producers	3	4	Widespread	Coral spawning: Mar & Oct			Low
	Socio-economic Pearling (inactive/pearling zones) Very significant for recreational fishing and charter boat tourism (Marine Management Area) Social amenities and other tourism Nominated place (national heritage)	3	2	Widespread	Year-round			Low
Barrow-Montebello Surrounds (Intertidal)	Coral and other subsea benthic primary producers	3	4	Widespread	Coral spawning: Mar & Oct	N/A (Intertidal)	N/A (Intertidal)	Low
	Seabirds Migratory birds	2	1					Low

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[3]	DoT Ranking (Dissolved oil)[3]	Key locations	Relevant key periods	Maximum time-averaged oil ashore (m^3) >100 g/m^2	Minimum arrival time (days)	Initial response priority
	Marine mammals Pygmy blue whale (Vulnerable) and humpback whale (Vulnerable) migration area	3	2		Pygmy blue whale migration: Apr to Aug Humpback whale migration: Jun to Jul			Low
	Socio-economic Significant for recreational fishing and charter boat tourism.	3	2					Low
Area C								
Barrow Island	Mangroves	3	3	Bandicoot Bay	N/A	188	1.1	Medium
	Regionally and nationally significant green (western side) and flatback turtle (eastern side) nesting beaches, Turtle Bay north beach, North and west coasts-John Wayne Beach, loggerheads and hawksbill	4	3	Green turtles on the western side of Barrow Island and flatback turtle nesting on the eastern side. Turtle Bay north beach, North and west coasts and John Wayne Beach have loggerhead and hawksbill turtle nesting	Year-round, peaking Oct to Jan			Medium

Protection Priority Area	Key sensitivities	DoT Ranking (Floating oil)[3]	DoT Ranking (Dissolved oil)[3]	Key locations	Relevant key periods	Maximum time-averaged oil ashore (m^3) >100 g/m^2	Minimum arrival time (days)	Initial response priority
	<u>Birds</u> Migratory birds (important habitat); 10th of top 147 bird sites, highest population of migratory birds in Barrow Island Nature reserve (south-south east island), Double Island has important bird nesting (shearwaters, sea eagles)	2	1	Double Islands, migratory birds at Bandicoot Bay and widespread on Barrow Island	Nesting: Sept to Feb			Medium
	Coral and other subsea benthic primary producers	3	4	Eastern side – Biggada Reef	Coral spawning: Mar & Oct			Low
	<u>Socio-economic</u> Significant for recreational fishing and charter boat tourism, Nominated place (National heritage), Industry – Reverse Osmosis Plant and port operations	5	5	Reverse Osmosis plant and port on eastern side of Island	N/A			Medium

6.7 Net Environmental Benefit Analysis

The IMT uses a net environmental benefit analysis (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 Environmental Team Lead will use the information in **Section 6.6** 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 DoT, consultation will be required during the NEBA process such that there is consistency in the sensitivities prioritised for response across the Controlling Agencies.

A strategic NEBA has been developed for all response strategies identified as applicable to credible spills identified in this OPEP, with the benefit or potential impact to each sensitivity identified (refer to **Table 6-6**). While not all spill response activities included in the strategic NEBA would be under the control of Santos during a spill incident, they have been included to assist the planning conducted by DoT.

In the event of a spill, NEBA is applied with supporting information collected as part of the Operational Monitoring Plan (**Section 10**) to:

+ 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 6-4**)
+ 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 Team 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 socioeconomic 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. It should be possible to see how the NEBA evolves as new information and expertise comes to light.

Table 6-6: Strategic NEBA matrix – marine diesel oil spills

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Chemical Dispersants	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Montebello Islands										
Turtle nesting – North West and Eastern Trimouille Islands (hawksbill); Western Reef, Southern Bay and North West Island (green)				N/A		N/A				
Mangroves – particularly Stephenson Channel				N/A		N/A			N/A	
Coral and other subsea benthic primary producers				N/A		N/A	NA	NA	N/A	
Seabird nesting				N/A		N/A				
Migratory shorebirds				N/A		N/A				
Humpback/pygmy blue whale migration				N/A		N/A	NA	NA	NA	
Fishing/charter boat tourism				N/A		N/A				

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Chemical Dispersants	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Barrow Island										
Turtle nesting – particularly flatback (western side) and green turtles (eastern side)				N/A		N/A				
Mangroves and mudflats (shorebird foraging) – Bandicoot Bay				N/A		N/A			N/A	
Coral and other subsea benthic primary producers – incl. Biggada Reef				N/A		N/A	NA	NA	N/A	
Seabird nesting - incl. Double Island				N/A		N/A				
Migratory shorebirds - particularly Bandicoot Bay				N/A		N/A				
Aboriginal listed sites incl. pearling camps				N/A		N/A				

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Chemical Dispersants	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Barrow-Montebello Surrounds(Intertidal)										
Coral and other subsea benthic primary producers				N/A		N/A	N/A	N/A	N/A	
Migratory seabirds				N/A		N/A				
Fishing/charter boat tourism				N/A		N/A				
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.									

6.8 Oil Spill Response As-Low-As-Reasonably-Practicable Assessment

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

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

7 External Notifications and Reporting Procedures

For oil spill incidents, the OSC (Vessel Master or Company Site Representative) will notify Perth office 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 Team Leader and the Environmental Team 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 onsite resources as well as larger Level 2/3 spills.

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

Table 7-1 outlines Santos oil spill reporting requirements associated with carrying out a Petroleum Activity in State and Commonwealth waters. 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).

The Incident Response Telephone Directory (SO-00-ZF-0025.02) 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 Oil Spill Response Organisations (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-0025.02) 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).

7.3 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 and State 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 VBA operations in Commonwealth waters that has the potential to cause moderate to significant environmental damage[1]	Notification by IMT Environmental Team Leader (or delegate)	Incident reporting requirements: https://www.nopsema.gov.au/environmental-management/notification-and-reporting/
NOPTA (National Offshore Petroleum Titles Administrator) DMIRS (WA Department of Mines, Industry Regulation and Safety)	Written report to NOPTA and DMIRS 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 IMT Environmental Team Leader (or delegate)	Provide same written report as provided to NOPSEMA
AMSA and DoT spill reporting requirements					
AMSA Rescue Coordination Centre (RCC)[2]	Verbal notification within two hours of incident	Under the MoU between Santos and AMSA	Santos to notify AMSA of any marine pollution incident[1]	Notification by IMT Environmental Team Leader (or delegate)	Not applicable

Agency or Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
WA Department of Transport (WA DoT)[2] (Maritime Environmental Emergency Response (MEER) Duty Officer)	+ Verbal notification within two hours + Follow up with POLREP (**Appendix C**) as soon as practicable after verbal notification + If requested, submit SITREP (**Appendix D**) 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 IMT Environmental Team Leader (or delegate)	WA DoT POLREP (**Appendix C**): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf WA DoT SITREP (**Appendix D**): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf
Protected areas, fauna and fisheries reporting requirements					
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 MNES are considered at risk from a spill or response strategy, or where there is death or injury to a protected species	Notification by IMT Environmental Team Leader (or delegate)	Not applicable

Agency or Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
Department of Biodiversity Conservation and Attractions (Pilbara and/or Kimberley Regional Office)	Verbal notification within two hours	DBCA consultation	Santos to notify AMSA of any marine pollution incident[1] Notify if spill has the potential to impact or has impacted wildlife in State waters (to activate the Oiled Wildlife Advisor)	Notification by IMT Environmental Team Leader (or delegate)	Not applicable
Department of Biodiversity Conservation and Attractions (State Duty Officer and Pilbara and/or Kimberley Regional Office)	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 Advisor)	Notification by IMT Environmental Team Leader (or delegate)	Not applicable

Agency or Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
Parks Australia (Director of National Parks)	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 IMT Environmental Team 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 Details of the relevant contact person in the IMT
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]	Notification by IMT Environmental Team Leader (or delegate)	Not applicable
Australian Fisheries Management Authority	Verbal phone call notification within 24 hours of incident	For consistency with DPIRD Fisheries notification	Reporting of marine oil pollution[1]	Notification by IMT Environmental Team 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 EPs.
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, 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 industry company personnel and response equipment. AMOSC's stockpiles of equipment include dispersant, containment, recovery, cleaning, absorbent, oiled wildlife and communications equipment. Equipment is located in Geelong, Fremantle, Exmouth and Broome .	Step 1. Obtain approval from Incident Commander to mobilise AMOSC. Step 2. Notify AMOSC that a spill has occurred. Put on standby as required – activate if spill response escalates in order to mobilise spill response resources consistent with the AMOSPlan. Step 3. E-mail confirmation and a telephone call to AMOSC will be required for mobilisation of response personnel and equipment, and callout 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 prior to mobilisation.	IMT Environment Team Leader (or delegate) will notify AMOSC (upon approval from Incident Commander)
Babcock Helicopters	Within two hours of incident having been identified	Verbal	Helicopters/pilots available for aerial surveillance. Contract in place.	Phone call.	IMT Logistics Team Leader (or delegate)

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
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.	IMT Logistics Team Leader (or delegate)
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.	IMT Logistics Team Leader (or delegate)
Astron	Scientific Monitoring Plan initiation criteria are met (**Section 16**)	Verbal and written	Astron has been contracted by Santos to provide Standby Services for Scientific Monitoring Plans (SMPs) 1-11. 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 Team 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.	IMT Environment Team Leader (or delegate)

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
Intertek Geotech (WA) Environmental Services and Ecotoxicology	When characterisation of oil is activated (**Section 10.6**)	Verbal	Oil analysis including GC/MS fingerprinting.	Phone call.	IMT Environment Team Leader (or delegate)
Oil Spill Response Limited (OSRL), OSRL Duty Manager	Within two hours of incident having been identified	Verbal OSRL Mobilisation Authorisation Form	Santos has a Service Level Agreement with OSRL, which includes the provision of support functions, equipment and personnel to meet a wide range of scenarios. At minimum OSRL will provide technical support to the IMT and place resources on standby. Further details available on the OSRL webpage.	Step 1. Contact OSRL Duty Manager in Singapore and request assistance from OSRL. Step 2. Send notification to OSRL as soon as possible after verbal notification. Step 3. Upon completion of the OSRL incident notification form, OSRL will plan and place resources on standby.	Designated call-out authorities (including Incident Commanders)
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.	IMT Environment Team Leader (or delegate)

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**		
	Incident Response Telephone Directory (SO-00-ZF-0025.02)	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

Santos incident response personnel use the incident action planning process to guide the incident response and to develop IAPs. All stakeholders involved in the incident achieve unity of effort through application of the disciplined planning process.

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

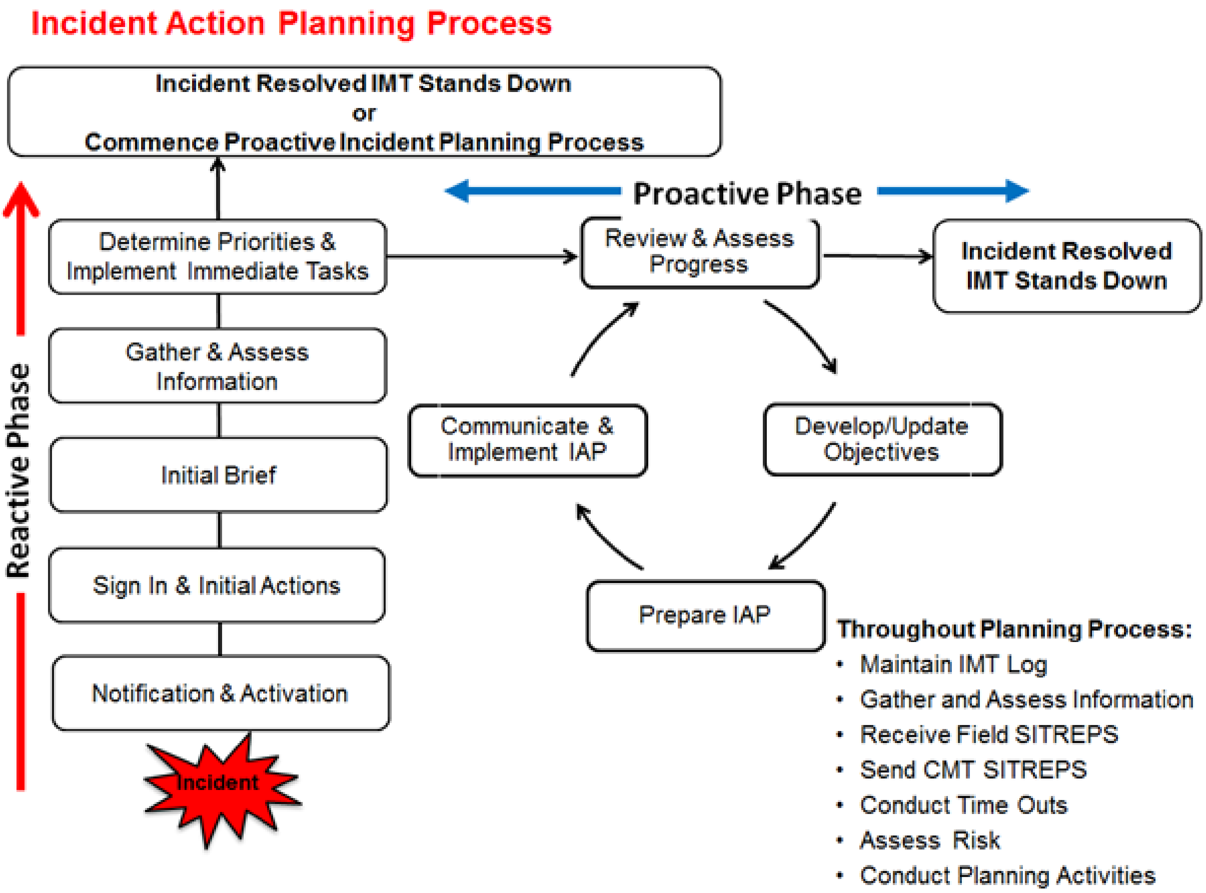

Figure 8-1: Incident Action Plan process

8.1 Reactive Phase Planning

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

First strike response actions are summarised in **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 strikes response actions, have been informed by a pre-assessment of applicable oil spill response strategies, priority response locations and a strategic net environmental benefit analysis (NEBA) also referred to as a spill impact mitigation assessment (SIMA). This pre-planning is included in **Section 6**. 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 (**Section 6.7**). This assessment helps verify that the response strategies pre-selected for each spill scenario are providing the best environmental outcome for the incident response.

8.2 Developing an Incident Action Plan

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

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

The performance against the objectives of the IAP must be documented in the Incident Log by the IMT. This provides the IMT with information required to assist in formulating the following IAP and provides evidence of Santos's 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, etc.) 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.

8.3 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
	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

9 Source Control Plan

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

For vessels with a Shipboard Oil Pollution Emergency Plan (SOPEP), the SOPEP will provide the relevant initial actions to control the source of the spill.

The sections below provide an outline of source control activities noting that Vessel SOPEP and Source Control Planning and Response Guideline (DR-00-ZF-10001), where applicable, will provide a higher level of detail for specific incidents.

9.1 Hydrocarbon Storage or Fuel Tank Rupture

Table 9-1 provides the environmental performance outcome, initiation criteria and termination criteria for source control response of a hydrocarbon storage or 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: Fuel tank rupture – 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	Level 2/3 incident (to be determined by OSC)
Applicable hydrocarbons	**MDO**
	✔
Termination criteria	The cargo in the ruptured fuel or storage tank is secured and release to the marine environment stopped

9.2 Implementation Guidance

Implementation guidance is summarised in **Table 9-2.** In the event hydrocarbon (MDO) is released from a vessel due to a ruptured fuel tank, the relevant vessel specific procedures will be applied. For offtake tankers and 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.

Section 9.3 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 Shipboard Oil Pollution Emergency Plan (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 immediately evaluated for implementation providing safe to do so: + Reduce the head of cargo 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 cargo loss. + If the affected tank is not easily identified, reduce the level of the cargo in the tanks in the vicinity of the suspected area if stability of the vessel will not be compromised. + Evaluate the transfer of cargo 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	☐

9.3 Environmental Performance

Table 9-3 indicates the environmental performance outcomes, controls and performance standards for the Source Control response strategy.

Table 9-3 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 – vessel collision	Vessel Spill Response Plan (SOPEP/SMPEP)	Support vessels have a shipboard oil pollution emergency plan (SOPEP) or shipboard marine pollution emergency plan (SMPEP) that outlines steps taken to combat spills	Audit records. Inspection records
		Spill exercises on support vessels are conducted as per the vessels SOPEP or SMPEP	Spill exercise close out reports

10 Monitor and Evaluate Plan

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 assessments.

10.1 Vessel Surveillance

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

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

Environmental Performance Outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making
Initiation criteria	Notification of a Level 2/3 spill - may be deployed in a Level-1 incident (to be determined by OSC)
Applicable hydrocarbons	**MDO**
	✔
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 poses safety risks.

10.1.1 Implementation Guidance

Table 10-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 10-3** 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 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.

Section 10.10 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. AIS vessel tracking is available through ER intranet page	OSC Operations Lead	☐
	Source additional contracted vessels if possible need for assistance		Logistics Team Leader	☐
	Record surface slick location and extent, weather conditions, and marine fauna. Complete vessel surveillance forms, located in **Appendix E** and provide to OSC (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 OSC	☐
Ongoing Actions	Review surveillance information to validate spill fate and trajectory		Planning Team Leader/GIS	☐
	Use available data to conduct operational NEBA and confirm that pre-identified response options are appropriate		Environment Unit Lead	☐

Action		Consideration	Responsibility	Complete
	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 - incl. Jetwave, Mermaid Marine, Bhagwan, Offshore Unlimited Vessels of opportunity identified through AIS Vessel Tracking	Availability dependent upon Santos and Vessel Contractor activities. Santos on-hire vessels include Ningaloo Vision Supply Vessel and Varanus Island Field Support Vessel	Vessels mobilised from Exmouth, Dampier, Varanus Island or offshore location. Locations verified through AIS Vessel Tracking Software	Pending availability and location. Expected within 12 hours.

Table 10-4: Vessel surveillance – First Strike response timeline

Task		Time from IMT call-out	
IMT begins sourcing Santos contracted vessel or vessel of opportunity (VOO) for on-water surveillance		<90 minutes	
VOO onsite for surveillance		<12 hours (daylight dependent)	
Minimum Resource Requirements			
One vessel. No specific vessel or crew requirements.			
Approximate Steam Time			
Operational Area	Nearest Deployment Location	Approximate Distance to Operational Area[4] (nautical miles)	Approximate Steam Time[5] (hours)
Area A	Dampier	165	17
	Varanus Island	213	22
	Port Hedland	76	8
Area B	Dampier	47	5
	Exmouth	178	18
	Varanus Island	58	6
Area C	Dampier	86	9
	Exmouth	102	11
	Varanus Island	21	3

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

[5] At average rate of 10 nautical miles per hour

10.2 Aerial Surveillance

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

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

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

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

10.2.1 Implementation Guidance

Table 10-6 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 10-7** provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial aerial surveillance operations are listed in **Table 10-8**. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Section 10.10 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-6: Implementation guidance – aerial surveillance

<table>
<tr><th colspan="2">Action</th><th>Consideration</th><th>Responsibility</th><th>Complete</th></tr>
<tr><td rowspan="2">Initial Actions</td><td rowspan="2">Contact contracted aviation provider- provide details of incident and request mobilisation to spill site for initial surveillance.</td><td rowspan="2">If aviation asset is available near spill location, utilise 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 prior to 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 (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</td><td rowspan="2">Operations Team Leader
Logistics Team Leader</td><td>☐</td></tr>
<tr><td>☐</td></tr>
</table>

	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 ER Intranet page.	Operations Team Leader Logistics Team Leader	☐
	Develop flight plan (frequency and flight path) to meet IMT expectations and considering other aviation ops. Expected that Two flights 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 Team Leader/Aviation Superintendent	☐
	Pre-flight briefing.		Aerial Observers Contracted aircraft provider/pilots	☐
	Aerial Observers to commence surveillance.	Consider procedure for interacting with marine fauna.	Operations Team Leader	☐
	Determine the spill extent by completing Aerial Surveillance Log (**Appendix F**) and Aerial Surveillance Surface Slick Monitoring Template. Calculate volume of oil (**Appendix G**). Take still and/or video images of the slick	Thickness estimates are to be based on the Bonn Agreement Code (Santos Procedure Index).	Aerial Observer	☐
	Record presence and type of fauna by completing the Aerial Surveillance Marine Fauna Sighting Record Sheet (**Appendix H**).		Aerial Observer	☐
	Record shoreline habitat type and degree of oiling by completing the Shoreline Aerial Reconnaissance Log (**Appendix I**).	Thickness estimates are to be based on the Bonn Agreement Code (Santos Procedure Index).	Aerial Observer	☐

	Action	Consideration	Responsibility	Complete
	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 Team Leader Operations Team Leader	☐
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 Team Leader/Aviation Superintendent Planning Team Leader	☐
	Mobilise additional aircraft and trained observers to the spill location to undertake ongoing surveillance activities.		Logistic Team Leader	☐
	Update common operating picture with surveillance information and provide updates to spill trajectory modelling provider.		Planning Team Leader 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 back-up) + additional as required	Karratha (primary base) Learmonth Onslow	Wheels up within one hour for Emergency Response. Spill surveillance <6 hours (daylight dependent)
Aerial Surveillance Crew	Santos aerial observers AMOSC Industry mutual aid	Seven Santos Seven AMOSC staff Five AMOSC Core Group 54 Additional trained industry personnel	Perth & VI (Santos aerial observers) Australia wide	Santos trained personnel - next day mobilisation to airbase <24 hours
Drones and pilots ** secondary response to assist shoreline and vessel-based surveillance	AMOSC OSRL – Third-Party UAV provider Local WA hire companies	Two 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

Task		Time from IMT call-out	
Santos helicopter activated for aerial surveillance		<3 hours	
Helicopter onsite for aerial surveillance		<6 hours (daylight dependent)	
Trained Aerial Observers mobilised to airbase		<24 hours	
Minimum Resource Requirements			
+ Santos contracted helicopter and pilots (based in Karratha) + Santos trained Aerial Observers			
Approximate Flight Times			
Operational Area	Nearest Airport	Approximate distance[6] (km)	Approximate flight time (hours: minutes)[7]
Area A	Karratha	220	1:50
	Port Hedland	120	1:00
	Learmouth	390	3:15
Area B	Karratha	96	00:25
	Port Hedland	130	1:05
	Learmouth	190	1:35
Area C	Karratha	96	00:48
	Port Hedland	200	1:40
	Learmouth	120	1:00

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

[7] At average flight speed of 120 knots

10.3 Tracking Buoys

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

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

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

10.3.1 Implementation Guidance

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

Section 10.10 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-10: Implementation guidance – tracking buoys

Action		Consideration	Responsibility	Complete
Initial Actions	Organise vessel to mobilise two tracking buoys from Varanus Island, Dampier Supply Base or Exmouth Freight and Logistics	Personnel and vessel safety is priority Current Santos on hire vessels or Vessels of Opportunity (VOO) can be used. AIS vessel tracking is available through ER intranet page	OSC/Operations Team Leader	☐
	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 Team Leader/GIS	☐
	Use tracking buoy data to maintain Common Operating Picture	Data tracked online	IMT Planning Team Leader/GIS	☐
	Relay information to spill fate modelling supplier for calibration of trajectory modelling		IMT Planning Team Leader/GIS	☐

	Action	Consideration	Responsibility	Complete
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 Team Leader	☐
	Mobilise additional tracking buoys if required from other Santos operations (Santos presently has 12 Tracker Buoys located on the NWS) or from AMOSC stockpiles		Logistics Team Leader	☐
	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 Team Leader	☐
	Deploy tracking buoys		Vessel Master	☐
	Monitor movement of tracking buoys		Planning Team Leader/GIS	☐
	Relay information to spill trajectory modelling supplier for calibration of trajectory modelling		Planning Team Leader/GIS	☐

Table 10-11: Tracking buoys resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Tracking buoys x 12	Santos	4 6 2	Varanus Island Dampier Exmouth (when NV in shipyard)	VI/Dampier buoys – 24 to 48 hours pending vessel availability Exmouth buoys (when NV in shipyard) – <12 hours pending vessel availability
AMOSC tracking buoys	AMOSC	2 6 4	Broome Fremantle Geelong	Response via duty officer within 15 minutes of first call- AMOSC personnel available within 1 hour of initial activation call. Equipment logistics varies according to stockpile location (refer to **Table 10-12**)

Table 10-12: AMOSC equipment mobilisation timeframes

	Perth	Darwin	Exmouth	Dampier	Broome
Geelong	40 hrs 3395 km	44 hr 3730 km	64 hrs 4520 km	70 hrs 4840 km	68 hrs 4970 km
Perth	NA	48 hrs 4040 km	15 hrs 1250 km	19 hrs 1530 km	27 hrs 2240 km
Exmouth	15 hrs 1250 km	38 hrs 3170 km	NA	7 hrs 555 km	16 hrs 1370 km
Broome	27 hrs 2240 km	22 hrs 1870 km	16 hrs 1370 km	11 hrs 855 km	NA

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

Task		Time from IMT call-out	
Tracking buoys deployed from Varanus Island or Dampier		<12 hours	
OR			
Tracking buoys deployed from Exmouth using vessel of opportunity		<12 hours	
Minimum Resource Requirements			
+ Two tracking buoys for initial deployment			
Approximate Steam Time			
Operational Area	Deployment Location	Approximate Distance to Operational Area[8] (nautical miles)	Approximate Steam Time[9] (hours)
Area A	Dampier	165	17
	Exmouth	323	33
	Varanus Island	213	22
Area B	Dampier	47	5
	Exmouth	178	18
	Varanus Island	58	6
Area C	Dampier	86	9
	Exmouth	102	11
	Varanus Island	21	3

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

[9] At average rate of 10 nautical miles per hour

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**
	✔
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.

Section 10.10 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 3-day forecast trajectory modelling.		Environment Team Leader	
	Determine requirement for gas/VOC modelling and request initiation	Hydrocarbon releases have human health and safety considerations for responders (volatile gases and organic compounds). This is to be considered for any tactics that monitor/recover oil – especially at close proximity to release site.	Safety Team Leader Environmental Team Leader	
	Operational surveillance data (aerial, vessel, tracker buoys) to be provided to modelling provider to verify and adjust fate predictions of the spill and improve predictive accuracy		Planning Team Leader/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 QA/QC procedures	Planning Team Leader/GIS	
	Place RPS Group modelling data into GIS/Common Operating Picture	RPS Group is 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 Team Leader/GIS	
	Identify location and sensitivities at risk, based on the trajectory modelling and inform IMT. Conduct NEBA on proposed response strategies.		Environment Team 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 Team Leader/GIS	
	Use results from other monitor and evaluate activities, and/or data derived from hydrocarbon assays of the source hydrocarbon as input data (if or when available) to improve model accuracy		Planning Team Leader/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	Two to four hours from activation

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

Task	Time from IMT call-out
RPS Oil Spill Trajectory Modelling (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**
	✔
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 (SAR) 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.

Section 10.10 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 Team Leader	☐
	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 Team Leader	☐
	Assess suitability and order imagery		Planning Team Leader	☐
	Integrate satellite imagery into common operating picture and provide to trajectory modelling provider for model validation		GIS Team Leader Planning Team Leader	☐
Ongoing Actions	Review surveillance information to validate spill fate and trajectory		Planning Team Leader	☐
	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 Team Leader	☐

Table 10-20: Satellite imagery resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Satellite Imagery	KSAT – Activated through AMOSC GDS – Activated through OSRL	Dependent upon overpass frequency (TBC on activation)	Digital	KSAT: one hour – if satellite images available

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**
	✔
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

Given MDO has been previously assayed, the general physical and chemical characteristics of this hydrocarbon is known and have been presented in **Appendix A**. 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, such as recovery and pumping equipment suitability, hydrocarbon storage and hydrocarbon disposal requirements.

10.6.1 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.

Section 10.10 lists the environmental performance standards and measurement criteria for this strategy.

10.7 Oil Sampling and Laboratory Analysis

Using onsite vessels of opportunity, oil samples (2 L per sample) are to be taken daily where possible from fresh oil, and from the weathered oil locations and dispatched to a laboratory for analysis. Samples are to be collected for 14 days post release where oil is available for sampling.

Laboratory analysis of the chemical and physical properties of the recovered oil, including gas chromatography/mass spectrometry (GC/MS) 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.

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 Team Leader Logistics Team Leader	☐
	Source sampling equipment. Confirm sampling methodology Confirm laboratory for sample analysis Develop H&S requirements/controls	Refer **Table 10-23** for resource availability Appendix A and D of CSIRO oil spill monitoring handbook provide suitable procedure.	Environment Team Leader Safety Team Leader	☐
	Vessel directed to sampling location	Sampling of oil at thickest part of slick – typically leading edge.	Operations Team Leader	☐
	Vessel crew to undertake sampling and delivery of samples to Exmouth, Dampier or Broome for dispatch to laboratory. Environmental Team Leader to confirm analysis of oil with lab	Exmouth, Broome and/or Dampier Logistics personnel to assist with logistics of sending oil samples to laboratory for analysis.	Operations Team Leader Environmental Team Leader Logistics Team Leader	☐
Ongoing Actions	Continue sample collection for 14 days 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 once mobilised to site.	Operations Team Leader Environment Team Leader Logistics Team Leader	☐

Table 10-23: Initial oil characterisation - resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Oil fingerprinting kits	AMOSC/Santos	3	Exmouth, Varanus Island, Dampier*	Within 12 hours
Bulk oil sampling bottles	Intertek/Santos	As required	Perth Exmouth, Varanus Island, Dampier*	Within 12 hours
Santos contracted vessel providers – incl. Jetwave, Mermaid Marine, Bhagwan, Offshore Unlimited Vessels of Opportunity identified through AIS vessel tracking system	Availability dependent upon Santos and Vessel Contractor activities. Santos on-hire vessels include Ningaloo Vision Supply Vessel and Varanus Island Field Support Vessel	Vessels mobilised from Exmouth, Dampier, Varanus Island or offshore location. Locations verified through AIS vessel tracking system	Pending availability and location. Expected within 12 hours	Santos Contracted Vessel Providers – incl. Jetwave, Mermaid Marine, Bhagwan, Offshore Unlimited Vessels of Opportunity identified through AIS Vessel Tracking
NATA accredited Laboratory/personnel for analysis	Intertek	NA	Perth	24+ hrs

*Oil sampling kits incl dispersant shake test kits and sample bottles for laboratory analyses are currently being procured with the intent to store at Varanus Island and logistics yards at Exmouth and Dampier.

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

Task	Time from IMT call-out
Oil sample collection	<12 hours (daylight dependent)
Oil samples arrive at lab for analysis	<36 hours
Minimum Resource Requirements	
+ One vessel. No special requirements. Oil sampling can be done concurrently with other tasks. + One oil fingerprinting kit[10]. + Sampling jars for bulk oil collection.	

[10] Oil fingerprinting kits and sample bottles for laboratory analyses are currently being procured with the intent to store at Varanus Island and logistics yards at Exmouth and Dampier.

10.8 Operational Water Quality Monitoring

10.8.1 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** ✔
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 complimentary to scientific water quality monitoring (SMP1) delivered through the Oil Spill Scientific Monitoring Plan in terms of methodology and required skillset and can be provided through Santos's Scientific Monitoring Provider (**Section 16**).

10.8.2 Implementation Guidance

Refer to **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.

Section 10.10 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 (IAP) 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 be conducted along a depth profile which captures the three dimensional distribution of the oil. For a subsea release or where surface oil is present in shallow water (<5 m) this 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 QA/QC samples incorporated into replicates. + Concurrent with collection of water samples a conductivity-temperature-depth (CTD) meter shall be deployed at each site along the same depth profile from which water samples are collected. The CTD will require fluorometry and dissolved oxygen (DO) sensors as part of the sensor package to record the presence of oil (fluorometry) and the activity of hydrocarbon degrading bacteria (dissolved oxygen). + Water samples also to be provided to an independent NATA-accredited laboratory in Perth for hydrocarbon suite analysis including polycyclic aromatic hydrocarbons (PAHs).
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 Team Leader	
	Obtain spill trajectory modelling and provide to Monitoring Service Provider.		Environment Team Leader Planning Team Leader 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 Team Leader	
	Develop health and safety plan including potential exposure to volatile gases/VOCs.	Refer Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)	Monitoring Service Provider Safety Team Leader	
	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 Team Leader	
	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 OSC Operations Team Leader Environment Team Leader Logistics Team Leader	

Action		Consideration	Responsibility	Complete
Ongoing Actions	Monitoring results to be conveyed to IMT through Common Operating Picture and provided to spill trajectory modeller to validate predictions.		Planning Team Leader GIS Support Environment Team 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. 15 (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 - incl. Jetwave, Mermaid Marine, Bhagwan, Offshore Unlimited	Availability dependent upon Santos and Vessel Contractor activities. Suitable vessels identified through AIS Vessel Tracking	Vessels mobilised from Exmouth, Dampier, Varanus Island or offshore location. 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 ER Intranet for vessel specification + Water quality monitoring team (through monitoring service provider) + Water quality monitoring equipment (through monitoring service provider)	

10.9 Shoreline and Coastal Habitat Assessment

Table 10-30 provides the Environmental Performance Outcome, initiation criteria, termination criteria and other key aspects for this strategy.

Table 10-30: Shoreline and coastal habitat 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**
	✔
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 on-ground assessments.

DoT are the designated Control Agency for shoreline response for all spills identified in this OPEP and will direct resources provided through Santos for the purposes of on-ground shoreline 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 **Section 10.2**).

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 (OSRA) Web Map Application (WMA)
+ Pilbara Region Oiled Wildlife Response Plan
+ WA Marine Oil Pollution Risk Assessment Web Map Application (WMOPRAWMP) (rankings and general information on protection priorities).

10.9.1 Implementation Guidance

The information provided below is included for planning purposes and represents how Santos would approach shoreline assessments. In the event of a spill with the potential for shoreline contact, DoT, will control shoreline assessments and ultimately personnel supplied through Santos will follow the direction of DoT; this may differ from that included below.

DoT provides guidance on shoreline assessments within their Oil Spill Contingency Plan.

Table 10-31 presents considerations for planning and conducting the assessments.

The implementation guide for Shoreline and Coastal Habitat and Assessment is found in **Table 10-32**.

Table 10-33 provides a list of resources that may be used to implement this strategy and **Table 10-34** details the minimum first strike mobilisation requirements for Santos on activation.

Section 10.10 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-31*: Shoreline and coastal habitat assessment considerations*

Considerations for Shoreline and Coastal Habitat Assessment	
Survey design	A shoreline 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. + Recommendations for response: – applicable strategies based on oil type and habitat – potential access, safety and environmental constraints – likely resourcing (personnel and equipment) requirements. Ground surveys undertaken on foot, by vehicles or by small vessel will occur at prioritised areas to provide a close range assessment of shoreline physical characteristics, coastal habitats/fauna, scale and character of oiling and safety/access constraints. Ground surveys should be undertaken by trained shoreline clean-up specialists and other trained oil spill responders as per those required for managing shoreline clean-up operations. This includes the use of AMOSC Core Group personnel across industry and State and National Response Teams as provided for under SHP-MEE and NatPlan. The deployment of ground survey teams will be directed by DoT as the Hazard Management Agency (HMA) and Control Agency for coastal/shoreline pollution in WA. 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 coastal 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 the following techniques: + 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

Considerations for Shoreline and Coastal Habitat Assessment	
	(transects, oil samples) + Transects (cross-shore, longshore) and vertical sediment profiles. + Samples of oil and/or oiled sediments. The following parameters should be assessed: + physical characteristics: rocky, sandy beach, flat, dune, other wetland + 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 10-32: Shoreline and coastal habitat assessment – implementation guidance

Action		Consideration	Responsibility	Complete
Initial Actions	Ensure initial notifications to WA DoT have been made	Refer to **Section 7** for reporting requirements	Environment Team Leader	☐
	Collect and provide spill trajectory modelling, other operational monitoring data and existing sensitivity information/mapping to Control Agency for assistance in identification of protection priority areas and NEBA.	Existing shoreline sensitivity mapping information for the Ningaloo Coastline is available on the Santos ER intranet site.	Environment Team Leader Planning Team Leader	☐
	Actions below are indicative only and are at the final determination of DoT as the Control Agency			
	Mobilise the AMOSC core group responders as required for industry support to DoT	Refer to **Table 10-33**	Incident Commander Operations Team Leader Logistics Team Leader	☐
	Assessment of shoreline character, habitats and fauna.	Refer to **Table 10-31**	AMOSC Core group and DoT	☐
	Assessment of shoreline oiling (if present).	Refer to **Table 10-31**	AMOSC Core group and DoT	☐
	Recommendations for response strategies.	Refer to **Table 10-31**	AMOSC Core group and DoT	☐

Table 10-33: Shoreline and coastal habitat assessment – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Santos and WA industry AMOSC core group staff and responders	Santos Core Group Industry Core Group, AMOSC staff	12 (Santos core group) 60+ (industry core group ops)	Perth, Dampier, Varanus Island and other NW locations	<24 hours from time of shoreline contact prediction

Table 10-34: 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 assessment team	<4 hours
AMOSC core group (shoreline assessment personnel) mobilised to site	<24 hours
Minimum Resource Requirements	
+ Minimum two AMOSC core group personnel	

10.10 Environmental Performance

Table 10-35: Environmental performance- monitor and evaluate

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	Response preparedness		
Monitor and Evaluate – vessel and aerial surveillance	Maintenance of MSAs with multiple vessel providers	Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	MSA with aircraft supplier	Master Services Agreement (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 Unmanned Aerial Vehicles (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		
Monitor and Evaluate – vessel and aerial surveillance	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's Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003)	Vessels comply with Santos's Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which ensures compliance with Part 8 of the Environment	Completed vessel statement of conformance

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		Protection and Biodiversity Conservation Regulations 2000 which includes controls for minimising the risk of collision with marine fauna	
		Aircraft comply with Santos's 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's 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
		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
	Response Preparedness		
Monitor and Evaluate – tracking buoys	Tracking buoys available	Maintenance of 12 tracker buoys throughout the activity	Computer tracking software Tracker buoy tests

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	Response Implementation		
Monitor and Evaluate – tracking buoys	Tracking buoy mobilisation	Minimum requirements mobilised in accordance with **Table 10-11**	Incident log
	Response Preparedness		
Monitor and Evaluate – oil spill modelling	Maintenance of contract for emergency response modelling	Maintenance of contract for forecast spill trajectory modelling services throughout activity	Modelling services contract
	Response Implementation		
Monitor and Evaluate – oil spill modelling	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
	Response Preparedness		
Monitor and Evaluate – satellite imagery	Satellite imagery	Contract in place with third party provider to enable access and analysis of satellite imagery	Contract with service provider
	Response Implementation		
Monitor and Evaluate – satellite imagery	Satellite imagery	Data incorporated into common operating picture and provided to spill modelling provider	Incident Log and Incident Action Plan
	Response Preparedness		
Monitor and Evaluate – oil and oil-in-water monitoring	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	Contract with monitoring service provider

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	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 and water quality monitoring kits pre-positioned at Exmouth, Dampier and Varanus Island (prior to end of 2020)	Evidence of deployment to site
	Response Implementation		
Monitor and Evaluate – oil and oil in water monitoring	Initial Oil Characterisation	Minimum requirements mobilised in accordance with Table 10-20	Incident Log
		Oil samples sent to laboratory for initial fingerprinting	Laboratory Sample Chain of Custody Record
		Oil samples to be sent immediately for laboratory ecotoxicity testing of oil	Laboratory Sample Chain of Custody Record
		90, 95 and 99% Species protection triggers levels will be derived from ecotoxicity testing results (minimum 5 species' tests) within 24 hours of receiving all results	Ecotoxicity report
	Operational Oil and Oil in Water Monitoring	IMT activates monitoring service provider within 4 hours	Incident Log
		Operational water sampling and analysis	Incident Log

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		surveys mobilised within 72 hours of approval	
		Fluorometry surveys mobilised within five days of initiation	Incident Log
		Daily report including fluorometry results provided to IMT	Incident Log
	Response Preparedness		
Monitor and Evaluate – shoreline assessments	AMOSC contract to facilitate mutual aid arrangements for access to Oil Spill Responders	Maintenance of AMOSC contract to facilitate mutual aid arrangements for access to Oil Spill Responders	AMOSC Participating Member Contract
	Response Implementation		
Monitor and Evaluate – shoreline assessments	Shoreline assessment	Minimum shoreline assessment requirements mobilised as per **Table 10-34**	Incident Log
		Shoreline Assessment strategies will be implemented under the direction of DoT as the HMA	Incident Action Plan
		Santos will make available AMOSC Core Group Responders for shoreline and coastal habitat assessment positions to the Control Agency	Incident Log
		Shoreline assessment reports provided to the IMT daily detailing the assessed areas to maximise effective utilisation of resources	Shoreline Assessment Reports
	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 (i.e. DoT)	Vessel specification documentation contained in IAP

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	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
	Conduct shoreline/nearshore habitat/bathymetry assessment	Unless directed otherwise by the designated Control Agency (i.e. DoT) 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 (i.e. DoT) 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 designated Control Agency (i.e. DoT) action plans for shoreline operations include operational restrictions on vehicle and personnel movement	IAP demonstrates requirement is met

11 Mechanical Dispersion Plan

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

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

Environmental Performance Outcome	To create mixing for oil and water to enhance natural dispersion
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**
	✔
Termination criteria	+ There is no longer a noticeable reduction of surface oil resulting from the activity, or + NEBA is no longer being achieved + Unacceptable safety risks associated with gas and VOCs at the sea surface + 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, 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 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 Team Leader Environment Team Lead Planning Team Leader	☐
	Safety team lead to develop a safety plan for the activity with respect to potential dangerous gasses and VOCs (including applicable controls).		Operations Team Leader Safety Team Leader	☐
	Notify vessel based responders to trial mechanical dispersion.		Operations Team Leader	☐
	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 Team Leader 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	Varies – check through vessel contractors/Santos vessel tracking system	Exmouth, Dampier, NW locations	Varies subject to location/availability

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			
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	Response implementation		
Mechanical Dispersion	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 DoT IC or delegate (as the Control Agency) to initiate response strategy.
Applicable hydrocarbons	**MDO** ✔
Termination criteria	+ NEBA has determined that this strategy is unlikely to result in an overall benefit to the affected shoreline/s; and + Agreement is reached with Jurisdictional Authorities to terminate the response strategy

12.1 Overview

Protection and deflection tactics are utilised 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 controlled by DoT as the relevant Control Agency. Santos will undertake first-strike protection and deflection activities as required. Upon assumption of Control Agency responsibilities, DoT 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 10**).

The information provided below is included for planning purposes and represents Santos's first-strike response for protection and deflection activities. In the event of a spill with the potential for shoreline contact, the ongoing response objectives, methodology, deployment locations and resource allocation will be controlled by DoT, as the Control Agency and therefore may differ from that included below.

Information gathered during operational monitoring including shoreline 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 dikes – 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 DoT, are listed in **Table 12-4**. The Incident Commander of the DoT's IMT (once the DoT assumes 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 WA DoT have been made.	Refer to **Table 7-1** for reporting requirements.	Environment Team Leader	☐
	Collect and provide spill trajectory modelling, other operational monitoring data and existing sensitivity information/mapping to Control Agency for confirmation of protection priority areas and NEBA.		Environment Team Leader Planning Team Leader	☐
	Where DoT has assumed roles as Control Agency, actions undertaken by DoT may differ to those below.			
	Conduct Operational NEBA to determine if protection and deflection is likely to result in a net environmental benefit using information from shoreline assessments (**Section 10.9**) and any tactical response plans for the area.	Pre-existing TRPs exist for 80 Mile Beach, Montebello Islands, Dampier, Roebuck Bay, Rowley Shoals, Ningaloo Coastline (including Muiron, Jurabi to Light House Bay Beaches, Mangrove Bay, Turquoise Bay and Yardie Creek) and Muiron Islands and are available on the Santos ER Intranet page.[11]	Environment Team 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 (but not be limited to) and should reference any existing TRPs: + 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	Operations Team Leader Planning Team Leader Environment Team Leader	☐

[11] 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
		for each location + list of resources (personnel and equipment) required + logistical arrangements (e.g. staging areas, accommodation, transport of personnel) + timeframes to undertake deployment + access locations from land or sea + frequency of equipment inspections and maintenance (noting tidal cycles) + waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes + no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (utilise existing roads and tracks first).		
	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 Team Leader Logistics Team Leader	☐
	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 Team Leader OSC	☐

Action		Consideration	Responsibility	Complete
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 Team Leader	☐
	Report to the Operations Team Leader on the effectiveness of the tactics employed.		Shoreline Response Team Leader – 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 setup at mainland locations under direction of DoT. 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 Team Leader	☐

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

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
AMOSC nearshore boom and skimming equipment	AMOSC	Beach Guardian (98 × 25 m lengths) Zoom Boom (199 ×25 m lengths) HDB Boom (two 200 m lengths) Curtain Boom (58 × 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 1 hour of initial activation call. Equipment logistics varies according to stockpile location. For mobilisation timeframes, refer **Table 10-12**.
AMSA nearshore boom/skimmer equipment	AMSA	Canadyne inflatable Structureflex inflatable Versatech zoom inflatable Slickbar - solid buoyancy Structureflex - solid buoyancy	Karratha × 5 Karratha × 10; Fremantle × 15 Karratha × 5; Fremantle × 13 Karratha × 2 Karratha × 3; Fremantle × 10	Access to National Plan equipment through AMOSC. For mobilisation timeframes, refer **Table 10-12**.

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
		Structureflex - land sea Skimmers: None for inshore HFO or heavy crude	Karratha × 30; Fremantle × 30 other locations around Aust	
Santos owned nearshore boom/skimming equipment	Santos	Beach Guardian (eight 25 m lengths) Zoom Boom (16 × 25 m lengths) Two Desmi DBD16 brush skimmers	Varanus Island Varanus Island 1 ea Dampier and VI	Within 12 h for deployment by vessel from VI.
Personnel (field responders) for OSR strategies	AMOSC Staff	8	Fremantle × 2 Geelong × 6	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 Aus facilities × 10 Port Bonython (SA) × 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.

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 protection site or deployment port location	<12 hours
Protection booming equipment mobilised to protection site or deployment port location	<12 hours
Waste storage equipment mobilised to protection site or deployment port location	<12 hours
Boom deployment vessel/remote island transfer vessel mobilised to protection site or deployment port location	<12 hours
AMOSC Staff and Industry Core Group mobilised to protection site or deployment port location	<24 hours
Protection/deflection operation deployed to protection location	<24 hours (weather/daylight dependent)
Minimum Resource Requirements	
NB: Resource requirements for protection and deflection will be situation/receptor specific. Tactical Response Plan (TRPs) if developed for the area/receptor will outline suggested resource requirements. TRPs are held by Santos and DoT and have been developed for 80 Mile Beach, Montebello Islands, Dampier, Roebuck Bay, Rowley Shoals, Ningaloo Coastline (including Muiron, Jurabi to Light House Bay Beaches, Mangrove Bay, Turquoise Bay and Yardie Creek) and Muiron Islands and are available on the Santos ER Intranet page[12]. 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 (refer TRP if applicable) + one skimmer appropriate for oil type + waste storage equipment + one Protection and Deflection Team (six AMOSC Core Group members) + personal protective equipment.	

[12] 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	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 Dampier, Exmouth and Port Hedland regions	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 DoT	Incident log
	Shoreline Protection and Deflection Plan	Santos IMT to confirm protection priorities in consultation with DoT	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 (NEBA)	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 (i.e. DoT).	Vessel specification documentation contained in IAP.
	Conduct shoreline and coastal habitat/bathymetry assessment	Unless directed otherwise by the designated Control Agency (i.e. DoT) a 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 DoT IC or delegate (as the Control Agency) to initiate response strategy
Applicable hydrocarbons	**MDO** ✔
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 surveys 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 controlled by DoT as the relevant Control Agency. Santos will undertake first-strike activations as triggered, until such time as DoT assume control. Upon assumption of Control Agency responsibilities, DoT 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 VBA operations, shoreline contact may occur and therefore clean-up of shorelines may be required.

MDO is likely to be difficult to remove given its light nature and high weathering potential. It can be readily washed from sediments by wave and tidal flushing. The likely waste products from an MDO spill shoreline response would be contaminated sand and debris.

Shoreline clean-up techniques include:

+ shoreline and coastal habitat assessment – uses assessment processes (refer to **Section 10.9**) 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 (this is unlikely to be required for an MDO spill)
+ 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 DoT, 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 DoT as the Control Agency**			
	Initiate Shoreline and Coastal Habitat Assessment (if not already activated).	Refer to **Section 10.9** for additional information.	Environment Team Leader	☐
	Using results from Shoreline and Coastal Habitat Assessment, conduct Operational NEBA to assess shoreline-clean up suitability and recommended tactics for each shoreline location.	Shoreline and Coastal Habitat 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 Advisor if spill response activities overlap with potential areas of cultural significance.	Environmental Team Leader	☐
	If operational NEBA supports shoreline clean-up, prepare a Shoreline Clean-up Plan for inclusion in the IAP.	Shoreline Clean-up Plan may include (but not be limited to): + clean-up objectives + clean-up end points (may be derived from Shoreline and Coastal Habitat Assessment) + clean-up priorities (may be derived from Shoreline and Coastal Habitat 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	Environmental Team Leader Planning Team Leader Operations Team Leader	☐

Action		Consideration	Responsibility	Complete
		comparison to the size of the coastal community) + permits required (if applicable) + chain of command for onsite personnel + list of resources (personnel, equipment, PPE) 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 + establishment of 'no access' and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (utilise existing roads and tracks first). Refer to IPEICA-IOGP (2015) for additional guidance on shoreline clean-up planning and implementation.		
	In consultation with the Control Agency procure and mobilise resources to a designated port location for deployment, or directly to location via road transport.		Logistics Team Leader Supply Team 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 Lead, who could be an AMOSC Core Group Member or trained member of the AMSA administered	Operations Team Leader Logistics Team Leader Deputy Logistics Officer (DoT IMT)	☐

Action		Consideration	Responsibility	Complete
		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 and Coastal Habitat Assessment Teams in consultation with the DoT. Team members will verify the effectiveness of clean-up, modifying guidelines as needed if conditions change.		
Ongoing Actions	Shoreline Response Team Lead shall communicate daily reports to the IMT Operations Team Leader 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 and Coastal Habitat Assessment and Clean-up they will be better placed to adapt their recommendations as the clean-up progresses and judge when the agreed end-points have been met.	Shoreline Response Team Leader Operations Team Leader	☐
	The IMT Operations Team Leader shall work with the Planning Team Leader 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 and Logistics Team Leaders.		Operations Team Leader Planning Team Leader	☐
	Monitor progress of clean-up efforts and report to the Control Agency.		Operations Team Leader OSC Deputy OSC (DoT 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, wheel barrows, 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	Exmouth, Karratha, Perth, Broome	
Shoreline flushing (pumps/hoses)	AMOSC	Shoreline flushing kit Shoreline impact lance kit	Fremantle × 1, Geelong × 1 Geelong × 1	Response via duty officer within 15 mins of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes, see **Table 10-12**
Nearshore skimmers/hoses	AMOSC AMSA	See 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 mins of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes, see **Table 10-12**

Santos

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
	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 × 8 Vikotank (13000 L)	Geelong × 4; Fremantle × 2; Exmouth × 2 Broome × 1	15 mins 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	Karratha × 4; Fremantle × 4	Access to national Plan equipment through AMOSC
	via North West Alliance contract	Refer **Table 15-3**	Perth, Karratha	24+ hours
Personnel (field responders) for OSR strategies	AMOSC Staff	8	Fremantle × 2 Geelong × 6	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 Aus facilities × 10 Port Bonython (SA) × 2	12+ hours

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
	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 Core Group mobilised to site/deployment port location	<24 hours
Clean-up equipment mobilised to site/deployment port location	<24 hours
Waste storage equipment mobilised to site/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	<48 hours
Minimum Resource Requirements	
NB: Resource requirements for shoreline clean-up will be situation/receptor specific. Tactical Response Plan (TRPs) if developed for the area/receptor will outline suggested resource requirements and shoreline assessments (as part of operational monitoring strategy) will be conducted prior to clean-up to confirm techniques. TRPs are held by Santos and DoT and have been developed for 80 Mile Beach, Montebello Islands, Dampier, Roebuck Bay, Rowley Shoals, Ningaloo Coastline (including Muiron, Jurabi to Light House Bay Beaches, Mangrove Bay, Turquoise Bay and Yardie Creek) and Muiron Islands and are available on the Santos ER Intranet page[13]. 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 includes: – one Team Leader (AMOSC staff, Industry Core Group or Santos Core Group) – ten to 30 Shoreline Clean-up Responders (AMOSC Crore Group, Santos contracted labour hire personnel).	

[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

13.3 Shoreline Clean-up Resources

Shoreline clean-up equipment (**Appendix J**) 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 Perth, Karratha 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's 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. Once activated as Control Agency, deployment will be under the direction of DoT and the advice of shoreline clean-up specialists from AMOSC Core Group and National/State response teams. Shoreline Assessments (**Section 10**) will provide information to guide the clean-up strategy and deployment of equipment resources.

Spill modelling indicates shoreline loading (over 100 g/m^2) of up to a maximum of ~197 m^3 at the Montebello Islands (refer **Section 6.3**). Hydrocarbons could also load onto shorelines of Barrow Island (maximum ~188 m^3), noting that these worst case loadings may come from different model simulations. Barrow-Montebello Surrounds is an intertidal receptor with no shoreline accumulation can occur.

Shoreline clean-up can be an effective technique for reducing the potential for hydrocarbons to remobilise to other locations. However, prolonged shoreline clean-up operations or large-scale operations involving large numbers of personnel may cause adverse environmental impacts, as the constant removal of oil through mechanical or manual techniques can result in a removal of substrate (e.g. sand, pebbles). If this process is conducted over a long period of time, this may result in geomorphological changes to the shoreline profile.

The shorelines predicted to be contacted are important nesting/breeding sites with high conservation values, therefore intensive clean-up operations will potentially do more damage than the oil alone. For this reason, shoreline clean-up operations at sensitive locations will involve smaller teams for a longer period and flooding or flushing (depending on the degree or oiling and hydrocarbon type). Although this may take longer to undertake the clean-up, it is considered that the benefits outweigh the impacts as smaller teams are more targeted, recovering more oil and less sand and debris, reducing trampling of oil into the shoreline profile and will minimise physical impacts on the coastlines and their sensitive species.

To approximate the likely waste produced and time required to conduct a manual shoreline clean-up, a conservative bulking factor of ten has been applied to the worst-case scenario. Using the ~197 m^3 loading, a bulking factor of ten would result in up to 1,970 m^3 of oily waste. An estimate of required resources for clean-up can be made by applying a removal rate of 1 m^3 per person per day for manual removal. For example, 30 small teams consisting of 6 personnel (including one trained responder per team) could theoretically remove a loading of 197 m^3 (1,970 m^3 oily waste) in roughly 11 days. This calculation assumes oil is accessible for removal (i.e. on accessible sections of coastline) and there would be a net benefit in removing all oil. Dependent on the nature of the oiling, habitat type, access constraints and environmental sensitivities nearby, larger teams of responders and mechanical aids can be employed to remove oil at a greater rate.

13.4 Shoreline Clean-up Decision Guides

A number of shoreline types are found within the EMBA associated with VBA operations, including:

+ mangroves
+ rocky shores including cliffs, intertidal platforms and loose rocks
+ sandy beaches
+ intertidal mudflats and sandflats.

The shoreline types are amenable in varying degrees to clean-up methods depending upon the type of hydrocarbon spilt. To assist with planning purposes, guidance for the selection of appropriate shoreline response strategies based on shoreline sensitivities is provided within **Appendix K**.

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

The DoT OSCP (2015) also provides guidance on shoreline clean-up techniques.

13.5 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	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member 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

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**
	Labour hire onboarding procedure (for low skilled shoreline clean-up personnel)	Development of onboarding procedure for oil spill response labour hire	Onboarding procedure
	Response Implementation		
	Mobilisation of minimum requirements for initial response operations	Minimum requirements mobilised in accordance with **Table 13-4** unless directed otherwise by DoT	Incident log
	Shoreline Clean-Up Plan	Santos IMT to confirm protection priorities in consultation with DoT	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	NEBA Template
		IAP Shoreline Clean-up Sub-plan developed to provide oversight and management of shoreline clean-up operation	Dated operational NEBA indicates completion prior to shoreline clean-up activities commencing
		Clean-up strategies will be implemented under the direction of DoT as the HMA	DoT Incident Action Plan
		Santos will make available AMOSC Core Group Responders for shoreline clean-up team positions to the Control Agency	Incident Log
		Santos will make available to the Control Agency equipment from Santos, AMOSC and OSRL stockpiles	Incident Log

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**
		Effectiveness of shoreline clean-up to be evaluated by Team Leaders and reported to IMT for inclusion in NEBA. NEBA undertaken every operational period by the relevant Control Agency to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan	Dated NEBA and IAP
	Prioritise use of existing roads and tracts	Unless directed otherwise by the designated Control Agency (i.e. DoT) 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 (i.e. DoT) 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
	Use of Heritage Advisor if spill response activities overlap with potential areas of cultural significance	Unless directed otherwise by the designated Control Agency (i.e. DoT) a Heritage Advisor 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 DoT and DBCA	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

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**
	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 (i.e. DoT) 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 designated Control Agency (i.e. DoT) 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 Response Plan

Note: Department of Transport (DoT) is the Control Agency and Department of Biodiversity, Conservation and Attractions (DBCA) is the Jurisdictional Authority for oiled wildlife response within State waters. Santos is the Control Agency for oiled wildlife response within Commonwealth waters.

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

Environmental Performance Outcome	Implement tactics in accordance with the Western Australian Oiled Wildlife Response Plan (WAOWRP) 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
Applicable hydrocarbons	**MDO**
	✔
Termination criteria	+ Oiling of wildlife have not been observed over a 48-hour period + Oiled wildlife has been successfully rehabilitated + Agreement is reached with Jurisdictional Authorities and stakeholders to terminate the incident response

14.1 Overview

Santos will provide all necessary resources to assist DoT in an oiled wildlife response in State waters, mainly, and initially, through its access to AMOSC oiled wildlife resources. Timely provision of equipment and personnel will be provided by AMOSC to DoT as the Control Agency/Lead IMT through a combination of owned and operated equipment, call-off contracts with suppliers, and the management of industry OWR response personnel through an Industry Oiled Wildlife Advisor (OWA). This team will work in conjunction with DBCA OWR capability under the direction of the DoT Incident Controller. Where Santos is the Control Agency for OWR in Commonwealth waters, AMOSC will also provide the above mentioned resources and be supported by DCBA, but would instead work under the direction of the Santos IC.

The key plan for oiled wildlife response (OWR) in WA is the WA Oiled Wildlife Response Plan (WAOWRP). The WAOWRP has been developed by DBCA and AMOSC, on behalf of the petroleum industry, and DBCA to define the minimum standards for OWR in WA as a sub-plan to the State Hazard: SHP-MEE. The WA OWRP can also be used for guidance to OWR in Commonwealth waters adjacent to State waters, noting that OWR requirements in State waters are expected to be greater. The Pilbara and/or the East and West Kimberley Region OWRP, which sits under the WA OWRP provides operational guidance to respond to injured and oiled wildlife in the Pilbara and Kimberley regions and covers the areas potentially contacted by a spill from VBA operations.

The sections below provide guidance to the Santos IMT on OWR stages of response and implementation. In some cases, the implementation guidance (**Table 14-5**) includes detail which is additional to what is provided in the WAOWRP. The information below should be used in conjunction with the WAOWRP.

14.2 Stages of Response to Oiled Wildlife

The WAOWRP includes eight stages to an OWR, which are described in **Table 14-2**. If an OWR is initiated, implementation will follow these stages, as appropriate to the nature and scale of the incident.

Table 14-2: Oiled wildlife response stages (adapted from WAOWRP)

Stage	Description
Stage 1: Initial wildlife assessment and notifications	Gather situational awareness on whether an OWR impact has occurred or is imminent and complete notifications to Jurisdictional Authorities and external support agencies.
Stage 2: Mobilisation of wildlife resources	Mobilise initial preventative measures and/or mobilisation of resources to deal with incident in early stages of development.
Stage 3: Wildlife reconnaissance	Wildlife Reconnaissance for the OWR should occur as part of the implementation of surveys for the fauna related Operational Monitoring Plans (OMPs) undertaken to aid planning and decision making for executing spill response or clean-up operations. Wildlife Reconnaissance will be required for the duration of the wildlife response operations.
Stage 4: IAP wildlife sub-plan development	The Wildlife Response Sub-plan should include operational components (relevant to the scale of the OWR), being: + wildlife impact assessment + reconnaissance and monitoring + search and collection + carcass collection and necropsy storage + field stabilisation + wildlife transport + wildlife processing/admission + wildlife intake and triage + wildlife cleaning + rehabilitation/conditioning + release + post-release monitoring + OWR termination and demobilisation. (It should be noted that separate strategies and protocols may be required for different species groups).
Stage 5: Wildlife rescue and staging	This includes commencing actions such as hazing, pre-emptive capture, administering first-aid and holding and/or transportation of wildlife to oiled wildlife facilities. If oiled birds or non–avian wildlife were to be observed at sea, on-water collection should be considered for the effective capture of oiled animals before they become so debilitated that their chance of survival is severely affected (IPIECA, 2017).

Stage	Description
Stage 6: Establishment of an oiled wildlife facility	Treatment facilities would be required for the cleaning and rehabilitation of affected animals. A vessel-based 'on-water' facility would likely need to be established to enable stabilisation of oiled wildlife before transport to a suitable treatment facility
Stage 7: Wildlife rehabilitation	Considerations include a suitable rehabilitation centre and personnel, wildlife housing, record keeping, release and post-release monitoring
Stage 8: Oiled wildlife response termination	Demobilisation of the OWR should be undertaken in accordance with parameters or endpoints established in the IAP and supplementary Wildlife Response Sub-plan. This decision will be made in consultation with the relevant jurisdictional authorities and support agencies

14.3 Oiled Wildlife Response Levels and Resourcing

An impact assessment threshold of $10 g/m^2$ for impacts on fauna from floating hydrocarbons is provided in the Commonwealth Exploration VBA EP. This conservative threshold is broadly accepted as being the minimal thickness of surface hydrocarbons that may result in adverse impacts to seabirds through ingestion from preening of contaminated feathers (French-McCay, 2016) and is also considered appropriate for turtles, sea snakes and marine mammals (NRDAMCME, 1997).

Review of the worst-case spill modelling indicates that floating hydrocarbon concentrations above $10 g/m^2$ may extend up to 225 km from the spill location and have a maximum shoreline loading of 197.4 m^3, at 100 g/m^2, affecting 9.9 km along the Montebello Islands. Other shorelines including Eighty Mile Beach, Bedout Island, Dampier Archipelago, Lowendal Islands, Barrow Island, Muiron Islands and Ningaloo Coast North could also be affected.

Conservative estimates for OWR planning predict a worst-case OWR for this activity will be an OWR Level 6 as defined in the WAOWRP (2014), given the potential for shoreline accumulation at Bedout Island with large Brown Boobies colonies and Eighty Mile Beach. For a Level 6 response, it is expected that up to 122 personnel will be required, with a range of skill levels (**Table 14-4** – OWR 1 = basic training to OWR 4 = OWR Advisor; Information drawn from WAOWRP). Personnel at skill levels OWR 2 to 4 and those with specialised skills (e.g. vets) are expected to be sourced through AMOSC, OSRL, DBCA, Universities and contractors.

Roles could be filled by the organisations listed above and through labour hire agencies that can provide field workers that undergo an induction and basic training. Basic training (over one day) for OWR personnel can be delivered as just-in-time training through an arrangement with DBCA.

Table 14-3: Indicative oiled wildlife response level (adapted from WA OWRP, 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
1	6	<3 days	1 to 2/day <5 total	None	None	None	None	None
2	26	>4 to 14 days	1 to 5/day <20 total	None	<20 hatchlings No juv/adults	None	None	None
3	59	>4 to 14 days	5 to 10/day	1–5/day < 10 total	<5 juv/adults <50 hatchlings	None	<5	None
4	77	>4 to 14 days	5 to 10/day <200 total	5 to 10/day	<20 juv/adults <500 hatchlings	<5, or known habitats affected	5 to 50	Habitat affected only
5	116	>4 to 14 days	10 to 100/day >200 total	10 to 50/day	>20 juv/adults >500 hatchlings	<5 dolphins	>50	Dugongs oiled
6	122	>4 to 14 days	> 100/day	10 to 50/day	>20 juv/adults >500 hatchlings	>5 dolphins	>50	Dugongs oiled

Table 14-4: Oiled wildlife response level and personnel numbers

Skill Level	OWR Response Level and Personnel Numbers					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
OWR 4	1	1	3	2	2	2
OWR 3	2	0	4	4	4	4
OWR 2	4	9	15	17	18	18
OWR 1	0	14	33	47	84	90
Technicians (i.e. vets)	0	1	2	4	4	4
Other specified skills	0	0	2	3	4	4
Total	**7**	**25**	**59**	**77**	**116**	**122**

14.4 Implementation Guidance

Oiled wildlife response activities can be resource intensive and require additional personnel to be positioned within the IMT. The oiled wildlife response team will be managed according to the Wildlife Division outlined in the WAOWRP. The wildlife operations unit will contain all the field staff and activities, including oiled wildlife reconnaissance, who will work in close consultation with personnel undertaking relevant monitor and evaluate activities. The IAP Wildlife Response Sub-plan as outlined in **Table 14-2** will form the key management system which will provide control and oversight over the response.

Table 14-5 provides guidance to the IMT on the actions and responsibilities that should be considered when implementing OWR. These actions are provided as a guide and should be read in conjunction with the WAOWRP. In some cases, the Implementation Guidance (**Table 14-5**) will provide additional detail to the WAOWRP and has greater linkages to other aspects of the response operation and this OPEP (e.g. NEBA and aerial surveillance). Mobilisation times for the minimum resources that are required to commence initial oiled wildlife operations are listed in **Table 14-6**.

The IC of the Control Agency is ultimately 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.

Information on resource capability for this strategy is shown in **Appendix M**.

Table 14-5: Implementation guidance – oiled wildlife response

	Action	Consideration	Responsibility	Complete
Stage 1: 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 oiled wildlife response by contacting AMOSC Duty Manager and DCBA State Duty Officer (who will then activate their respective Oiled Wildlife Advisors)	Obtain approval from IC prior to activating AMOSC Oiled Wildlife Advisor and/or DCBA Oiled Wildlife Advisor DoT will be the Control Agency for OWR in State waters	Environmental Team Leader	☐
	Notify DAWE 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 (Section 3**)**	Environmental Team Leader	☐
	Review all wildlife reports from surveillance or opportunistic activities and contact personnel who made the reports (if possible) to confirm information collected		Environmental Team Leader Wildlife Division Coordinator	☐

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), as defined in the WA OWRP (**Table 14-3**).	Oiled wildlife response activities can cause additional stress and mortality on individuals than oil pollution alone. The Environmental Team Leader and Wildlife Division Coordinator will determine via an Operational NEBA whether capture and cleaning of oiled wildlife will result in a net environmental benefit. This may be done in consultation with the DCBA and AMOSC Oiled Wildlife Advisors and any SME's as relevant (if available, but an Operational NEBA should not be delayed if they are not immediately available)	Environmental Team Leader Wildlife Division Coordinator Wildlife Branch Director	☐
Stage 2: Mobilisation of wildlife resources				
Determine resources required to undertake Stage 3: Wildlife Reconnaissance and provide list to Logistics Section		Confirm best reconnaissance platform (e.g. vessel, aerial, shoreline). Consider ability to share resources (e.g. Shoreline Clean-up Assessment Teams, Monitor and Evaluate activities)	Wildlife Division Coordinator Wildlife Reconnaissance Officer AMOSC OWA	☐
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 and DCBA		Refer to **Table 14-4** Consider need for veterinary care	Wildlife Division Coordinator Logistics Team Leader AMOSC OWA DBCA OWA	☐
Commence mobilisation of equipment (including adequate PPE) and personnel to required location/s			Wildlife Logistics Officer	☐
Contact OSRL to activate Sea Alarm if additional support is likely to be required to sustain an ongoing OWR			Environmental Team Leader	☐

Action	Consideration	Responsibility	Complete
Stage 3: Wildlife reconnaissance			
Determine reconnaissance plan including survey locations, techniques and priority species	Consult local experts, if available	Wildlife Division Coordinator Wildlife Reconnaissance Officer AMOSC OWA DBCA OWA Planning Team Leader	☐
Conduct reconnaissance activities and upon completion, submit report detailing: + area/s surveyed + estimated number of animals oiled or at risk of being affected + any deaths + species affected		Wildlife Division Coordinator Wildlife Operations Officer Wildlife Reconnaissance Officer OWR field personnel Operations Team Leader	☐
Stage 4: IAP wildlife sub-plan development			
Develop Wildlife Response Sub-plan for inclusion in the IAP IAP should include options for wildlife rescue and rehabilitation, including: + wildlife priorities for protection from hydrocarbons + any deterrence/hazing measures + anticipated number of oiled wildlife requiring rescue + reassessment of Oiled Wildlife Level + actions required for the collection, recovery, transport and treatment of oiled wildlife; including resourcing of	Consider need for any permits to conduct activities	Wildlife Division Coordinator Wildlife Operations Officer AMOSC OWA DBCA OWA Environmental Team Leader	☐

Action	Consideration	Responsibility	Complete
equipment and personnel anticipated			
Stage 5: Wildlife rescue and staging			
Implement Wildlife Response Sub-plan for deterrence/hazing, pre-emptive capture, relocation	Trained personnel required to handle wildlife	Wildlife Division Coordinator Wildlife Operations Officer Wildlife Rescue Officer AMOSC OWA DBCA OWA OWR field personnel Operations Team Leader	☐
Establish staging site/s	Wildlife first aid/stabilisation may be required at staging site if OWR treatment facility is more than two hours away	Wildlife Operations Officer Wildlife Staging/Holding Officer OWR field personnel Operations Team Leader	☐
Stage 6: Establishment of an oiled wildlife facility			
Implement Wildlife Response Sub-plan for oiled wildlife facility	Utilise OWR containers where possible. One container/kit can treat up to 150 OWR units, so will be adequate to treat oiled wildlife from the worst-case spill. If insufficient, additional OWR containers can be requested via the IAP to AMSA Should oiled wildlife treatment be set up on vessels rather than onshore, the vessel needs to have adequate deck space to house the oiled wildlife equipment and be able to provide continuous hot water at constant pressure and temperature. The vessel must have the ability to properly contain and dispose of contaminated wastewater. Most Support Vessels are likely to	Wildlife Division Coordinator Wildlife Operations Officer Wildlife Facilities Officer AMOSC OWA DBCA OWA OWR field personnel Operations Team Leader	☐

Action	Consideration	Responsibility	Complete
	be appropriate as they have mud and other tanks for water storage and oil-water systems for treating water		
Stage 7: Wildlife rehabilitation			
Implement Wildlife Response Sub-plan for rehabilitation	Animals need to be stable to withstand stress of washing. Oiled animals, particularly birds, cannot thermoregulate and need to be kept indoors in a temperature-controlled room. The room needs to be well ventilated to disperse the hydrocarbon fumes	Wildlife Division Coordinator Wildlife Veterinarian Wildlife Rehabilitation Officer AMOSC OWA DBCA OWA OWR field personnel Operations Team Leader	☐
Stage 8: Oiled wildlife response termination			
Liaise with Jurisdictional Authorities regarding OWR termination, using endpoints established in the IAP and supplementary Wildlife Response Sub-plan (Termination and Demobilisation section)		Wildlife Division Coordinator AMOSC OWA DBCA OWA Incident Commander	☐

Table 14-6: Oiled wildlife response – first strike response timeline

Task	Time from oiled wildlife contact (predicted or observed)
IMT notifies regulatory authorities and AMOSC of oiled wildlife/potential for contact	<2 hours
Mobilise Santos personnel for oiled wildlife reconnaissance **this will be already occurring through Aerial Observer mobilisation and Shoreline Assessment Team mobilisation**	<24 hours
Mobilisation of AMOSC oiled wildlife equipment and industry OWR team to 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 Level 1 response as per the WA OWRP: + 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.	

14.5 Environmental Performance

Table 14-7 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 14-7: Environmental performance – oiled wildlife response

Environmental Performance Outcome	Implement tactics in accordance with the Western Australian Oiled Wildlife Response Plan (WAOWRP) 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 AMOSC, AMSA National Plan and Oil spill Response Limited (OSRL) throughout activity	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract.
			OSRL Associate Member Contract.
	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
	Santos Oiled Wildlife Response Framework	Development of a Santos Oiled Wildlife Response Framework (to be completed by end of 2020)	Santos Oiled Wildlife Response Framework
	Santos personnel trained on OWR	Additional Santos personnel trained in OWR during 2020	Training records
	Response Implementation		
	Mobilisation of minimum requirements for initial response operations	Minimum requirements mobilised in accordance with **Table 14-6** unless directed otherwise by DoT/DBCA	Incident log
	OWR managed in accordance with the WAOWRP	Prepare operational NEBA to help classify OWR level and determine if OWR activities are likely to result in a net environmental benefit	Records indicate operational NEBA completed prior to OWR operations commencing
		IAP Wildlife Response Sub-plan developed to provide oversight and management of OWR operation	Records indicate IAP Wildlife Response Sub-plan prepared prior to OWR operations commencing

15 Waste Management Plan

Table 15-1 provides the environmental performance outcome, initiation criteria 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, reusing and recycling waste where possible	
Initiation criteria	Response activities that will be generating waste have been initiated	
Applicable hydrocarbons	**MDO**	
	✔	
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 solid and liquid waste that will require rapid management, storage, transport and disposal. It is important that waste is collected and removed quickly to ensure waste management does not create a bottleneck in response operations.

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

Where Santos is the Control Agency, or at the request of the designated Control Agency, Santos will engage its contracted Waste Service Provider (WSP) to provide sufficient waste receptacles to store collected waste and manage oily waste collection, transport and disposal associated with spill response activities. The WSP will arrange for all personnel, equipment and vehicles to carry out these activities from nominated collection points to the final disposal points. Santos's Oil Pollution Waste Management Plan (QE-91-IF-10053) provides detailed guidance to the WSP in the event of a spill.

Where DoT is the Control Agency, Santos will provide a Facilities Support Officer to the DoT IMT Logistics Unit to support the DoT IMT in coordinating waste management services.

15.2 Implementation Guidance

Table 15-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 15-3** provides a list of resources that may be used to implement this strategy. 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 Telephone Directory (SO-00-ZF-00025.020) for contact details	Logistics Team Leader	☐
	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 Team Leader Planning Team Leader	☐
	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	Consideration would be given to positioning receptacles and locating temporary storage sites to ensure secondary contamination of sensitive receptors is avoided or minimised. The approval of temporary storage sites would be given through DWER	Logistics Team Leader Planning Team Leader Environmental Team 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 Team Leader Planning Team Leader	☐

Action		Consideration	Responsibility	Complete
	Once the above information is obtained, ensure all necessary waste management information is included in the IAP	Waste management should be conducted in accordance with Santos's 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	Logistics Team Leader (or delegate) Planning Team Leader Deputy Waste Management Coordinator (DoT IMT) 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 Team Leader (or delegate) Deputy Waste Management Coordinator (DoT IMT)	☐

Action		Consideration	Responsibility	Complete
Ongoing Actions	Provide ongoing point of contact between IMT and WSP	If DoT is the Control Agency, the Facilities Support Officer shall be the point of contact between DoT and the WSP	Deputy Waste Management Coordinator (DoT IMT) Logistics Team Leader	☐
	Ensure all waste handling, transport and disposal practices comply with legislative requirements	Alert Logistics Team Leader (or delegate)/Deputy Logistics Officer (if DoT is the Control Agency) if any non-compliance is anticipated or detected Site clean-up, removal and disposal of response waste should be conducted in accordance with Santos's 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	WSP Location Responsible Person or Operations Supervisor	☐
	Ensure records are maintained for all waste management activities, including but not limited to: + waste movements (including 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's 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 Department of Water and Environmental Regulation (DWER). DWER administers the *Environmental Protection Act* 1986 (WA) and is the relevant Regulatory Authority for waste management approvals. If required, DoT may establish an Operational Area Support Group (OASG), as defined in the State Hazard: SHP-MEE, to request support from relevant WA Government Agencies, including DWER, during a State waters spill response. The Santos's 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's activities.

15.4 Waste Service Provider Capability

Detailed guidance on Santos's Waste Service Provider responsibilities for spill response waste management is provided in the Santos' Oil Pollution Waste Management Plan (QE-91-IF-10053).

Key responsibilities of the waste service provider include:

+ Maintain emergency response standby preparedness arrangements, including:
  - Access to personnel, equipment and vehicles required for a first strike and ongoing response commensurate to Santos worse case spill and waste requirements.
  - Provide primary and secondary contact details for activation of spill response waste management services.
  - Have suitably trained personnel for completing critical tasks in spill response waste management.
  - Participation in exercising undertaken by Santos.
+ Have the 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)

15.5 Waste Management Resources

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

Table 15-3 provides waste service provider capability for waste removal and storage, which is in excess of the waste management requirements for spill response activities associated with this OPEP.

Table 15-3: NWA vehicle and equipment availability

Plant and Equipment	No.	Capacity	Functionality	Uses per week	Indicative waste stored/shifted per week (m^3)	NWA mobilisation schedule to meet estimated capacity			
						No. Sourced locally	No. Sourced State-wide and Nationally		
Waste removal						**48 hours**	**1 week**	**2 weeks**	**1 month**
Skip Lift Truck	12	Lift up to 15 tonnes	Servicing of skip bins	7	1260	4	3	3	2
Front Lift Trucks	10	28 m^3 Body	Servicing of front lift bins	7	1960	4	3	2	1
Side Loading Truck	10	18 m^3 Body	Servicing of MGBs	7	1260	1	2	4	3
Hook Lift Truck	5	70-tonne rated	Servicing of hook lift bins	7	2450	3	2	2	N/A
Flat Bed Truck	16	15 pallet spaces	Servicing of bins	7	840	3	6	4	N/A
Waste storage						**48 hours**	**1 week**	**2 weeks**	**1 month**
MGB’	500	240 litres	Mobile bins	2	240	200	300	N/A	N/A
Offshore eight-pack Lifting Cradle (MGB)	2	16 × 240 litre MGBs	Able to remove 16 × 240 L MGBs simultaneously	continuous		0	2	N/A	N/A

Plant and Equipment	No.	Capacity	Functionality	Uses per week	Indicative waste stored/shifted per week (m^3)	NWA mobilisation schedule to meet estimated capacity			
						No. Sourced locally	No. Sourced State-wide and Nationally		
Waste storage						48 hours	1 week	2 weeks	1 month
Lidded Bins	6	1,100 litres	Contain various waste streams	2	13	6	N/A	N/A	N/A
Front Lift Bins	50	3 m^3	Various waste streams	2	300	20	30	N/A	N/A
Front Lift Bins	25	4.5 m^3	Various waste streams	2	225	10	15	N/A	N/A
Offshore Rated Front Load Bins	100	3 m^3	Various waste streams	2	600	40	60	N/A	N/A
Offshore Rated Bins	45	7 m^3	Various waste streams	2	630	20	25	N/A	N/A
Marrell Skip Bins	60	6-9 m^3	Various waste streams	2	960	20	40	N/A	N/A
Hook Lift Bins	12	15-30 m^3	Various waste streams	25	6900	12	N/A	N/A	N/A
Forklift	4	4 tonne	All areas	Continuous	N/A	4	N/A	N/A	N/A

15.6 Waste Management Environmental Performance

Table 15-4 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 15-4: environmental performance – waste management

Environmental Performance Outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, reusing 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 Waste Service Provider for emergency response services
	Response Implementation		
	Implement Oil Pollution Waste Management Plan (QE-91-IF-10053)	Waste Service Provider to appoint a Project Manager within 24 hours of activation	Incident Log
		Provision of liquid oil waste tanks for containment and recovery operations to deployment port, if requested, within 24 hours	Incident Log
		Provision of waste bins for oil and oily waste for shoreline clean-up operations to clean-up site or deployment port, if requested, within 24 hours	Incident Log
		Waste Service Provider shall track all wastes from point of generation to final destination	Waste tracking records
		Waste Service Provider to provide monthly waste management reports and more regular situation reports during the response until termination criteria are met	Waste reports

16 Scientific Monitoring Plan

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 Scientific Monitoring Plans (SMPs) – **Appendix N**
Applicable hydrocarbons	**MDO**
	✔
Termination criteria	Refer to individual SMPs – Appendix N

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 scientific monitoring plan (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' Scientific Monitoring Plans (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**.

16.2 Scope

Santos will implement its SMPs, as applicable, for VBA operations 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 (ESC), 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 Scientific Monitoring Plan.

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 Commonwealth VBA operations **(Table 16-2**). These are detailed further in **Appendix N**; 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 Commonwealth VBA operations

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 prior to, 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.

Santos periodically review the status, availability and suitability of existing baseline data sources related to key environmental sensitivities in its areas of operations. **Appendix P** provides further information on Santos baseline data reviews and outlines the baseline date assessment process.

16.6 Monitoring Service Providers

Oil Spill Scientific Monitoring will be conducted on behalf of Santos by a contracted Monitoring Service Providers (MSPs) and applies to the implementation of SMPs 1 to 11 (**Table 16-2**). These services are provided by Astron Environmental Services (Astron) and primary sub-contractor (BMT).

For whale sharks, in addition to the monitoring that will be undertaken as part of SMP8 Marine Megafauna, additional scientific monitoring of whale sharks along the Ningaloo Coast will be undertaken (SMP12). Santos has historically and currently supports research on the behaviour, demography and migration patterns of whale sharks at Ningaloo Reef conducted by AIMS. 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 Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162), Santos' MSP provides the following scientific monitoring services to Santos:

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

Appendix P provides an overview of Santos's processes in place to provide assurance that its oil spill scientific monitoring arrangements for SMPs 1 to 11 are fit for purpose to meet the worst case first-strike monitoring requirements associated with the VBA operations.

16.7 Activation

The SMP Activation Process is outlined in **Appendix O**. SMPs are activated as per the initiation criteria for each as outlined in **Appendix N**. The SMP Activation Form is available on the Santos Procedures Index and IMT Environment Team Leader folder.

The Santos IMT Environment Team Leader (ETL) with support from IMT Environment Team members is responsible for activating the primary MSP. The Santos Environment Team will assist the MSP Monitoring Coordination personnel and relevant Technical Advisors 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 Team 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

Task	Time from activation of SMP
Santos IMT approve initial monitoring plan	<24 hours
Santos to mobilise sampling platforms to deployment location	<96 hours (72 hours from monitoring plan approval)
SMP teams and monitoring equipment mobilised to deployment locations	<96 hours (72 hours from monitoring plan approval)
Minimum Resource Requirements	
Initial resourcing requirements will be dependent upon the number of SMPs activated and the requirement for post spill baseline data to be collected. The first strike response process for scientific monitoring field teams are presented in **Appendix P**. + 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 equipment as detailed in the relevant SMP.	

16.8 Scientific Monitoring 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

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**
Scientific Monitoring	**Response preparedness**		
	Maintenance of Monitoring Service Provider contract for scientific monitoring services	Maintain access to specialist monitoring personnel and equipment by maintaining contract with Monitoring Service Provider throughout activity	Contract with monitoring service provider
	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

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**
	Water quality monitoring vessels	Maintenance of vessel specification for water quality monitoring vessels	Vessel specification
	Oil and water quality monitoring equipment	Oil and water quality monitoring kits pre-positioned at Exmouth, Dampier and Varanus Island (prior to end of 2020)	Evidence of deployment to site
	Response implementation		
	Activate Scientific Monitoring Plans	Initiation criteria of SMPs will be reviewed during the preparation of the initial IAPs 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 Monitoring Service Provider is to follow the process outlined in Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)	Incident Log
		Monitoring Service Provider shall commence activation process within 30 mins of initial notification form being received from Santos	Monitoring Service Provider records
		Santos personnel to support Monitoring Service Provider 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 Spill 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 (e.g. DBCA). 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.

A 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 complete the following tasks:

+ 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.
+ Conduct an investigation into the cause of the incident and report to relevant authorities.
+ Assess long-term environmental monitoring requirements.

18 OPEP Administration

18.1 Document Review and Revision

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 Environment Management of Change Procedure (EA-91-IQ-10001). This could include changes required in response to:

+ when major changes have occurred which affect Oil Spill Response coordination or capabilities
+ changes to the EP that affect Oil Spill Response coordination or capabilities (e.g. a significant increase in spill risk)
+ routine testing of the OPEP if improvements or corrections are identified
+ 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.

18.2 OPEP Custodian

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

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Appendix A: Hydrocarbon Characteristics and Behaviour

Marine diesel (MDO)

In the marine environment diesel 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 diesel from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance;
+ As wind increases, and breaking waves form, entrainment of diesel below the surface increases;
+ The evaporation rate of diesel will increase in warmer air and sea temperatures such as those present around the North West Shelf; 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.

ITOPF (2011) and Australian Maritime Oil Spill Centre-AMOSC (2011) categorises diesel as a light group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering.

For full details on the properties of marine diesel, refer to Section 7.5 of the *Commonwealth Exploration VBA EP (SO-91-BI-20011).*

Table A1: Characteristics of diesel

Hydrocarbon	Initial density (kg/m³)	Viscosity (cP) @ 25°C	Component	Volatiles (%)	Semi-volatiles (%)	Low volatility (%)	Residual (%)
			Boiling Points (°C)	<180	180–265	265–380	>380
Diesel	836.8	3.9	% of total	6	34.6	54.4	<5

Source: APASA (2013a)

Hydraulic oils

These are medium oils of light to moderate viscosity and behave similarly to marine diesel when spilt to the marine environment. They have a relatively rapid spreading rate and dissipate quickly in ocean conditions. Similar to diesel, hydraulic oil residue will have a tendency to sit on the surface during calm conditions and will entrain during variable winds between 4-19 knots; returning to the surface when conditions become calm. After several days up to 40% could be expected to evaporate and 15% decay (APASA 2013a).

Lubricating fluid

Lubricating oils vary widely but in general are comprised primarily of long-carbon chain, persistent, hydrocarbons (APASA 2013b). These are reasonably viscous and so the spreading rate of a slick of these oils would be slow. These will not readily move into the water column, therefore are likely to remain on the water's surface during calm to windy conditions. In the marine environment, approximately 90% residual of the total quantity of lubricating oil spilt is likely to remain after weathering (i.e. < 6% due to evaporation and < 8% due decay after several days). Lubricating oils also readily combine with sea-water to form a water-in-oil emulsion, taking up as much as 70% by volume as water (APASA 2013b).

Appendix B: Oil Spill Response ALARP Framework & Assessment

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 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 B1**.

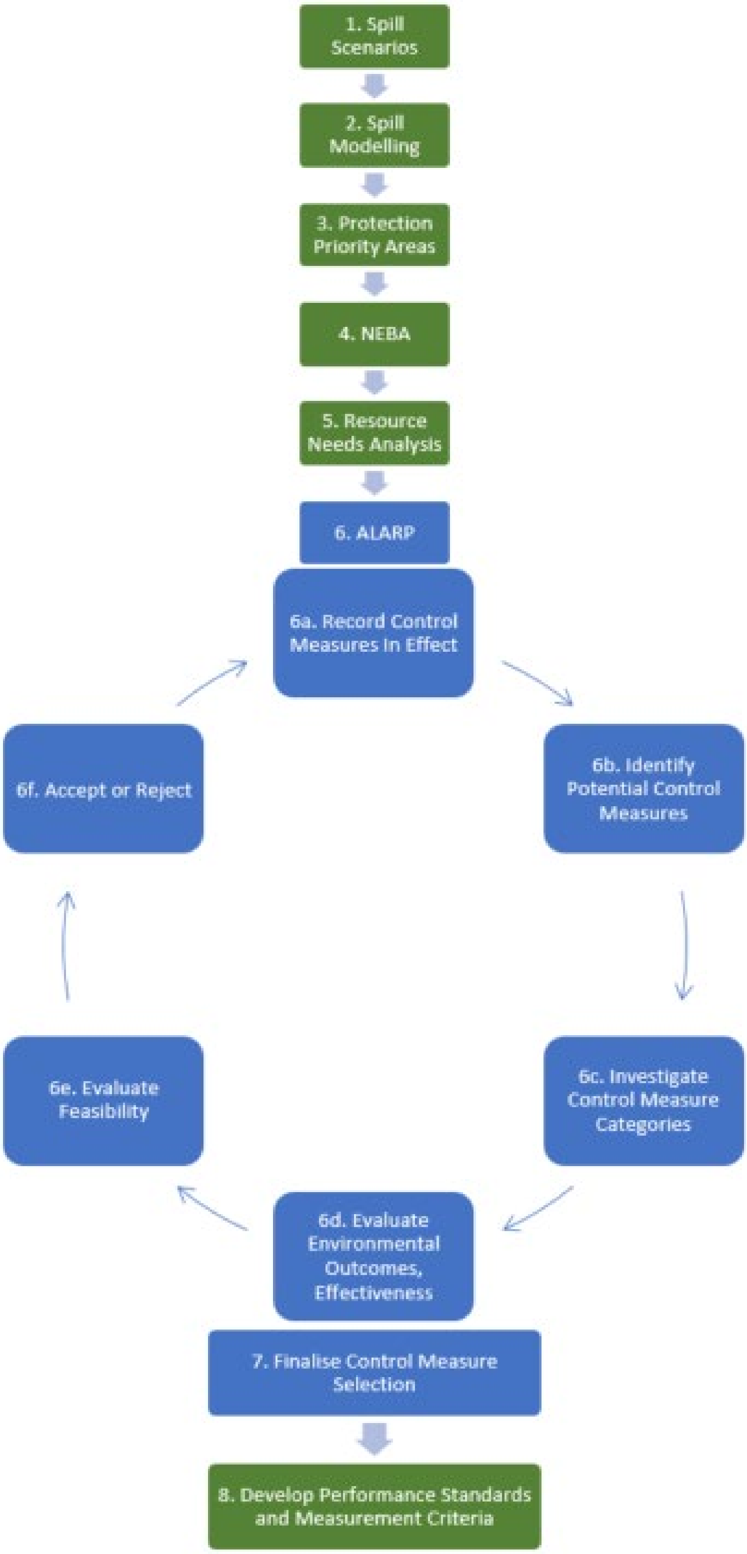

Figure B1: ALARP Assessment Framework

In **Figure B1**, 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 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 1, Step 6 (in BLUE). Criteria and definitions used to evaluate control measures are shorn in Table 1.

6a) Record Control Measures In Effect: the spill response control measures currently in place for Santos are listed here. The environmental outcomes and effectiveness of the in-effect control measures are noted, using the Resource Needs Analysis to assess whether there are any areas of improvement. Environmental outcomes include potential harmful effects of control measures.

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 practise 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 B1, 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 B1**.

Table B1: 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.
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>

Column	Description
	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

Commonwealth VBA Oil Spill Response ALARP Assessment

ALARP Assessment Summary - Source Control (refer worksheet for further detail)
Source control is limited to minimising potential volumes of MDO lost to the marine environment and no areas of improvement were identified. No 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 the OPEP. The key performance requirements are to follow the response actions listed in the respective ships SOPEP and conduct spill exercises in line with the ships SOPEP.
ALARP Assessment Summary - Monitor and Evaluate (refer worksheet for further detail)
Various, independent inputs from multiple service providers are used to build a detailed Common Operating Picture in the incident. Areas of improvement for monitor and evaluate activities were the availability of aerial observers and SCAT trained personnel in initial 24 hours of incident occurrence and availability of vessels for water quality monitoring. One potential Control Measure sought to make trained aerial observers available from Day 1 of a response, rather than Day 2, however an assessment of the Control Measure found that the cost was grossly disproportionate to the benefit. No potential Control Measures were identified to improve availability of SCAT trained personnel in the initial 24 hours of incident. A potential control measure to improve the availability of vessels for water quality monitoring by implementing more detailed vessel tracking parameters was evaluated and accepted. Six other potential Control Measures were also identified and assessed. Four were rejected as cost was grossly disproportionate to the reduction in risk, whilst two Control Measures around the provision of strategically located water quality monitoring kits and improved record keeping of service providers that could assist with fauna aerial observations were accepted as reasonably practicable. Eight additional potential Control Measures were identified and assessed. Three additional Control Measures were accepted as reasonably practicable. The accepted measures were: + - Develop vessel specifications for operational water quality monitoring vessel + - Purchase of First Strike Oil/Water quality monitoring kits to be positioned at Exmouth, VI and Dampier + - Maintain a list of providers that could assist with fauna aerial observations, e.g. whale shark spotting planes Five additional Control Measures were rejected as grossly disproportionate. Rejected response measures were: + - Purchase of oil spill modelling system and internal personnel trained to use system. - Additional satellite tracking buoys + - Ensure trained aerial observers based at strategic locations such as Dampier, Exmouth and Port Hedland - Trained monitoring specialists on site + - Ensure trained marine mammal/fauna observers based at strategic locations such as Dampier, Exmouth or Port Hedland. Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in the OPEP. 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 (refer worksheet for further detail)

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 the OPEP. 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 - Protect and Deflect (refer worksheet for further detail)

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.

Five additional potential Control Measures were identified and assessed. All additional Control Measures were rejected as grossly disproportionate. Rejected control measures 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 based at strategic locations such as Dampier and Exmouth

+ - Review of shoreline sensitivity mapping. Review of Tactical Response Plans (TRPs) and development of additional TRPs for key locations

An additional Control Measures was accepted:

- To develop list of small vessel providers in the Exmouth, Dampier and Port Hedland regions

Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in the OPEP. 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 (refer worksheet for further detail)

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.

The availability of labour hire personnel for initial stages of a response was identified as an area of improvement. Control Measures that were evaluated to improve the availability of labour hire was either not feasible or the cost was grossly disproportionate to the reduction in risk. The availability of shallow draft vessels in initial stages of a response was also identified as an area for improvement. Waste management may be a limiting factor for ongoing shoreline clean-up operations and further information is shown in the ALARP assessment for Waste.

Eight additional potential Control Measures were identified and assessed Two additional Control Measure were accepted as reasonably practicable. They were:

- - Develop vessel specification for shallow draft transfer vessels for remote island clean-up
- - Develop labour hire onboarding procedure for spill response to clarify the labour hire process for the Santos IMT

Six Control Measures were rejected as grossly disproportionate. Rejected control measures were:

- - Mechanical mobile plant equipment for clean-up pre purchased and positioned at strategic locations
- - Pre-purchase and storage of additional equipment (decontamination/staging equipment, clean-up and flushing, PPE) at strategic locations
- - 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 strategic locations or can be mobilised within short time frames
- - 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 the OPEP. 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, shoreline assessments conducted as part of operational monitoring 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 (refer worksheet for further detail)

Oiled wildlife equipment including first strike kits and containers can be mobilised from regional locations and Perth. Further equipment is available through national or international resources to implement a timely and sustained response adequate for the scale of worst case oiled wildlife operations identified in the OPEP. The availability of trained personnel in the initial stages of an incident is a limiting factor for this response strategy. Control Measures around the provision of trained personnel were reviewed to identify that trained Santos personnel could be based not just in the Perth Office but also at VI and DC facilities. Potential Control Measures around additional responders through pre-hiring or contracts with additional service providers were investigated but were found to be not beneficial and/or the cost was grossly disproportionate to risk reduction. An additional area of improvement is clarity for how Santos will integrate with Control Agencies OWR. It has been identified that additional planning captured in a Santos Oiled Wildlife Response Framework is a practicable control measure to ensure that resources are deployed in a coordinated approach.

Five additional potential Control Measures were identified and assessed.
Three Control Measures were accepted as reasonably practicable. The accepted control measures were:

- - Development of a Santos Oiled Wildlife Response Framework which will set the corporate guidance for OWR preparedness and response and define how Santos will integrate with Control Agencies to provide a coordinated response
- - Additional Santos OWR trained personnel positioned at VI and Perth
- - Develop labour hire onboarding procedure for spill response to clarify the labour hire process for the Santos IMT

Two Control Measures were rejected as grossly disproportionate. Rejected control measures were:

- - Pre-hire and/or prepositioning of staging areas and responders
- - Direct contracts with service providers

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the OPEP. 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 a Performance Standards.
ALARP Assessment Summary – Waste (refer worksheet for further detail)
The Santos contract with the waste service provider has provisions for waste management operations of the scale estimated to be required in worst case scenarios detailed in the OPEP. Further detail is captured in the Waste Management Plan - Oil Spill Response Support (QE-91-IF-10053). The waste service provider can mobilise waste receptacles to Exmouth and Port Hedland from Karratha within 12 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. One potential Control Measure to address this area of improvement was identified and assessed but cost was grossly disproportionate to risk. No other potential control measures were identified. Four potential additional Control Measures were identified and assessed. One additional Control Measure was accepted as reasonably practicable: + - Develop offshore waste transfer concept of operations procedure for IMT Three 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 the OPEP. 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 (refer worksheet for further detail)
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. Additionally, three potential Control Measures were identified and assessed. A potential Control Measure on the purchase and standby of scientific monitoring resources was found to be grossly disproportionate in cost in comparison to the reduction in risk. Two potential Control Measures on improved record keeping for scientific monitoring consumable requirements and suppliers and the provision of water quality sampling kits to be located at strategic regional locations were both found to be reasonable and practicable. Four additional potential Control Measures were identified and assessed. Two additional Control Measure were accepted as reasonably practicable. The accepted control measures were: + Before planned activity commences, purchase of oil/water quality sample kits for scientific monitoring personnel to be positioned at Varanus Is., Exmouth and Dampier + Determine required vessel specifications required for Scientific Monitoring implementation

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

- Scientific monitoring personnel, plant and equipment on standby at the operational location

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the OPEP. 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.

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcomes	Effectiveness	Feasibility	Accept/ Reject
ALARP Assessment Summary - Source Control Source control is limited to minimising potential volumes of MDO lost to the marine environment. No areas of improvement were identified. No 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 the OPEP.							
reduce release - spills from refuelling	Refer to the Commonwealth Exploration Vessel Based Activity Environment Plan (SO-91-BI-20011) - Section 7.5.1.1 for an evaluation of Control Measures for refuelling.						
reduce release from hydrocarbon storage or fuel tank rupture	Refer to the Commonwealth Exploration Vessel Based Activity Environment Plan (SO-91-BI-20011) - Sections 7.5.1.2 for an evaluation of Control Measures for a vessel storage/fuel tank rupture. This includes the following Control Measure which works to control the volume of hydrocarbon released to the environment during an incident: *Vessel spill response plan (SOPEP/SMPEP)						

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcomes	Effectiveness	Feasibility	Accept/ Reject
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. Areas of improvement for monitor and evaluate activities were the availability of aerial observers and SCAT trained personnel in initial 24 hours of incident occurence and availability of vessels for water quality monitoring. One potential Control Measure sought to make trained aerial observers available from Day 1 of a response, rather than Day 2, however an assessment of the Control Measure found that the cost was grossly disproportionate to the benefit. No potential Control Measures were identified to improve availability of SCAT trained personnel in the initial 24 hours of incident. A potential control measure to improve the availability of vessels for water quality monitoring by implementing more detailed vessel tracking parameters was evaluated and accepted. Six other potential Control Measures were also identified and assessed. Four were rejected as cost was grossly disproportionate to the reduction in risk , whilst two Control Measures around the provision of strategically located water quality monitoring kits and improved record keeping of service providers that could assist with fauna aerial observations were accepted as reasonably practicable. Eight potential Control Measures were identified and assessed. Three Control Measures were accepted as reasonably practicable. The accepted response strategies were: - Determine required vessel specifications and improve accuracy of Vessel Tracking System - Purchase of First Strike Oil/Water quality monitoring kits to be positioned at Exmouth, VI and Dampier. Development of technical procedure for sample collection by untrained personnel - Maintain a list of providers that could assist with fauna aerial observations, eg whale shark spotting planes Five Control Measures were rejected as grossly disproportionate. Rejected response strategies were: - Purchase of oil spill modelling system and internal personnel trained to use system - Additional satellite tracking buoys - Ensure trained aerial observers based at strategic locations such as Dampier, Exmouth and Port Hedland - Trained monitoring specialists on site - Ensure trained marine mammal/fauna observers based at strategic locations such as Dampier, Exmouth and Port Hedland Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in the OPEP. 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.							
Oil Spill Trajectory Modelling	Maintain contract with Oil Spill Trajectory Modelling service provider. The service provider will be contacted immediately (within 2 hours) upon notification of a level 2 or 3 spill. Upon activation, the service provider will provide trajectory models within: - 2 hours for OILMAP model for offshore and open ocean; - 4 hours for OILMAP operations for near-shore; and - Detailed modelling service is available for the duration of the incident.	In effect	System	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of contract	In effect
	Access to additional spill modelling capability through OSRL	In effect	System	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact	An additional service provider ensures redundancy (independence) if for some reason the other service provider was unable to fulfil the function. There is also the possibility of increased functionality associated with improved certainty of the modelling results if both service providers are activated.	Cost of membership	In effect
	Purchase of oil spill modelling system and internal personnel trained to use system	Alternative	System, people	This could result in the faster generation of the initial model which may result in an environmental benefit as a consequence of the IMT making operational decisions quicker	Potentially increases availability Decrease in functionality- in house service may not be across technical advances to same extent as contracted service providers	Purchase of system, training of personnel, and on-call roster	Reject The cost of purchasing the system, training and having personnel on-call is disproportionate to any potential gains from potentially being able to deliver initial results quicker than the 2 hour turn-around currently guaranteed by the service provider
Tracking buoy	Level 1: Two tracking buoys mobilised from Varanus Island, Dampier Supply Base or Exmouth Freight and Logistics.	In effect	Equipment	Tracker buoys provide real-time verification data (particularly beneficial at night and in conditions limiting aerial surveillance)	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of equipment	In effect
	Level 1. Santos WA owns and maintains 12x tracking buoys across its NW facilities.	In effect	Equipment	Tracker buoys provide real-time verification data (particularly beneficial at night and in conditions limiting aerial surveillance)	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of equipment	In effect

	Level 2: tracking buoys available from AMOSC and through AMOSC Mutual Aid	In effect	Equipment	Tracker buoys provide real-time verification data (particularly beneficial at night and in conditions limiting aerial surveillance)	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of membership	In effect
	Level 3: tracking buoys available from OSRL. Transit times (air) Singapore to Karratha = 3–5 days.	In effect	Equipment	Tracker buoys provide real-time verification data (particularly beneficial at night and in conditions limiting aerial surveillance)	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of membership	In effect
	Santos WA purchase additional satellite tracking buoys	Additional	Equipment	There is no expected environmental benefit from having additional tracking buoys, as there are already tracking buoys located on the facility/ vessel ready for deployment 24/7 and any additional needs can be provided by Santos owned stocks. Additional buoys can be accessed from AMSA, AMOSC and OSRL within days with no additional upfront cost.	Increase in availability and reliability	Cost of purchasing additional tracking buoys	Reject Does not provide any additional environmental benefit and the cost associated is therefore not warranted
Aerial surveillance - aircraft and crew	Maintain contract with service provider for dedicated aerial platform operating out of Karratha. (Helicopter services available through Santos WA's primary contracted supplier. Activation of aerial surveillance using helicopter pilots will occur in 3 hours of notification of the spill. Helicopter on site for surveillance within 6 hrs. Surveillance and recording using helicopter pilots is considered adequate for situational awareness.)	In effect	System	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation of aerial observers in initial 24 hours of incident	Cost of contract	In effect
No alternate, additional or improved control measures identified							
Aerial surveillance - observers	Level 1: Trained Santos observers will be available from Day 2 of the incident, following activation	In effect	People	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation of aerial observers in initial 24 hours of incident	Cost of training and maintaining trained staff	In effect
	Level 2: Access to additional aerial observers through AMOSC Staff and Industry Mutual Aid Core Group Responders	In effect	People	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of AMOSC membership	In effect
	Level 3 : Access to additional aerial observers through OSRL (18 people). OSRL staff initial 5 technical advisors available from 2 to 3 days, remaining personnel available from 4 to 5 days, subject to approvals/ clearances.	In effect	People	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of OSRL membership	In effect
	Ensure trained aerial observers based at strategic locations such as Dampier, Exmouth and Port Hedland	Additional	People	Current capability meets need and therefore environmental benefit would be incremental. Having trained observers living locally and on short notice to mobilise would result in trained aerial observers available from Day 1 (current arrangements are that the pilot would provide the initial observations and recording on Day 1 with trained aerial observers from Perth and VI mobilised and operational by Day 2).	Improved availability and reliability	Costs associated with staff employment and training	Reject Cost is considered disproportionate to the incremental benefit given surveillance on Day 1 by pilots is considered sufficient

Aerial surveillance - unmanned aerial vehicles	Level 2: Unmanned Aerial Vehicles for aerial surveillance available through AMOSC (UAVs and pilots can be accessed through AMOSC with a mobilisation time of 12+ hours)	In effect	System	Use of UAVs may provide an environmental benefit compared to alternative options (such as helicopters and fixed wing aircraft) given shorter deployment time and ability to assess difficult areas.	Provides functionality and availability Area of improvement; none identified	Cost of membership with AMOSC	In effect
	Level 3: Unmanned Aerial Vehicles for aerial surveillance available through OSRL	In effect	System	Use of UAVs may provide an environmental benefit compared to alternative options (such as helicopters and fixed wing aircraft) given shorter deployment time and ability to assess difficult areas.	Provides functionality and availability Area of improvement; none identified	Cost of membership with OSRL	In effect
No alternate, additional or improved control measures identified							
Vessel surveillance	Level 1: vessels in use by Santos WA and located at (or in transit to) Ningaloo Vision, Exmouth, Dampier or Varanus Is. could be used for surveillance purposes in the event of a spill. (Vessel surveillance will be activated within 90 minutes for available on-site vessels. Santos has access to on-hire vessels supporting Santos WA's VI and NV facilities. Santos WA Vessel Monitoring System has access to automatic identification system live-vessel tracking portal to establish vessel availability.)	In effect	Equipment	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact. In comparison to aerial surveillance, vessel surveillance provided limited information.	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of existing contracts with vessel providers	In effect
	Level 2: vessels sourced through Master Service Agreement, located in region and tracked by Santos WA Vessel Monitoring System.	In effect	Equipment	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact. In comparison to aerial surveillance, vessel surveillance provided limited information.	Improves availability and reliability Area of improvement; none identified	Cost of vessel monitoring. Cost of contracts at the time of requirement.	In effect
	Level 3: vessels sourced without existing contracts from any location	In effect	Equipment	Knowledge of the spill, provided in a short-time frame, will inform the IMT decisions with the aim of reducing and mitigating environmental impact. In comparison to aerial surveillance, vessel surveillance provided limited information.	Improves availability and reliability Area of improvement; none identified	Cost of contracts at the time of requirement.	In effect
No alternate, additional or improved control measures identified							
Water Quality Monitoring (operational and scientific)	Maintain of monitoring service provider contract for water quality monitoring services. Water quality monitoring personnel, equipment and vessel deployed to spill site within 72 hrs.	In effect	System	This monitoring will confirm the distribution and concentration of oil, validating spill trajectory modelling and inform the IMT decisions with the aim of reducing and mitigating environmental impact	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; availability of vessels	Cost of contracts	In effect
	Access to additional water quality monitoring services through OSRL	In effect	System	This monitoring will confirm the distribution and concentration of oil, validating spill trajectory modelling and inform the IMT decisions with the aim of reducing and mitigating environmental impact	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; availability of vessels	Cost of OSRL membership	In effect
	Determine required vessel specifications and improve accuracy of Vessel Tracking System	Improved	Procedure	Improve mobilisation time	Improved availability and reliability	Cost to determine vessel specifications	Accept

	Purchase of First Strike Oil/Water quality monitoring kits to be positioned at Exmouth, VI and Dampier. Development of technical procedure for sample collection by untrained personnel	Additional	Equipment, procedure	Will enable Oil fingerprinting, and initial measurements of oil concentrations	Improve function, availability, survivability and compatibility	Cost of purchasing equipment and developing procedure	Accept
	Trained monitoring specialists on site	Additional	People	Ensure sampling is conducted correctly	Improves reliability	Costs associated with staff employment	Reject This is not necessary as a good procedure for sample collection is in place
Satellite Imagery	Maintain membership with AMOSC provider to enable access and analysis of satellite imagery.	In effect	Systems	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	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of membership with AMOSC	In effect
	Maintain membership with OSRL to enable access to and analysis of satellite imagery	In effect	System	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	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of membership with OSRL	In effect
No alternate, additional or improved control measures identified							
Shoreline Assessment	Level 1: WA-based AMOSC staff and core group operations personnel (Santos WA has arrangements through AMOSC to mobilise WA-based AMOSC staff and Core Group personnel to site 24 hours following initiation)	In effect	People, procedures	To assist in determining which response methods are most appropriate for shorelines, it is necessary to obtain information about shoreline character, 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	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement; availability - reduce time to mobilise personnel to strategic locations	Cost of AMOSC membership	In effect
	Level 3: Maintain membership with OSRL to access SCAT trained responders (OSRL, 18 people). OSRL staff initial 5 technical advisors available from 2 to 3 days, remaining personnel available from 4 to 5 days, subject to approvals/ clearances.	In effect	People, procedures	To assist in determining which response methods are most appropriate for shorelines, it is necessary to obtain information about shoreline character, 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	Provides additional functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of OSRL membership	In effect
No alternate, additional or improved control measures identified							
Wildlife Reconnaissance (aerial/ vessel surveillance. Shoreline and coastal habitat assessment)	Maintain contract with scientific monitoring service provider for access to fauna aerial observers and personnel experienced in conducting relevant fauna surveys.	In effect	People, procedures	Wildlife reconnaissance aids the IMT to plan and make decisions for executing an oiled wildlife response and for minimising impacts to wildlife associated with the clean-up response	Provides functionality, availability and compatibility Area for improvement; availability - reduce time to mobilise personnel to strategic locations	Cost of contract	In effect
	Maintain a list of providers that could assist with fauna aerial observations, eg whale shark spotting planes	Additional	People	Wildlife reconnaissance aids the IMT to plan and make decisions for executing an oiled wildlife response and for minimising impacts to wildlife associated with the clean-up response	Improves availability and reliability Area of improvement; none identified	Cost of developing and maintaining list	Accept

	Ensure trained marine mammal/fauna observers based at strategic locations such as Dampier, Exmouth and Port Hedland	Additional	People	Having trained marine mammal/fauna observers living locally and on short notice to mobilise would result in trained aerial observers available from Day 1	Improved availability and reliability	Costs associated with staff employment and training	Reject Maintaining trained fauna observers at location is considered grossly disproportionate as they are required only for the initial stages of the response until observers from scientific monitoring provider can be mobilised.

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcomes	Effectiveness	Feasibility	Accept/ Reject
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 Control Measures were identified and assessed. Performance Standards and Measurement Criteria that have been developed for the in effect Control Measures are shown in the OPEP. 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							
Mechanical Dispersion	Use of vessel crews, contract vessels and vessels of opportunity to disperse small areas of amenable hydrocarbon types such as marine diesel.	In effect	People, equipment	Enhanced dispersion and biodegradation of released hydrocarbons	Provides availability, reliability, survivability, compatibility and independence. Limited functionality as mechanical dispersion is secondary response strategy limited by weather conditions, hydrocarbon type and hydrocarbon volume.	Cost of vessel time	In effect

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcomes	Effectiveness	Feasibility	Accept/ Reject
ALARP Assessment Summary - Protect and Deflect 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 WA 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. Five additional potential Control Measures were identified and assessed. Four Control Measures were rejected as grossly disproportionate. Rejected response strategies were: - Santos WA to purchase additional shoreline and nearshore booms and ancillary equipment - Access to additional shallow draft boom tow vessels owned by Santos WA - Ensure trained personnel based at strategic locations such as Dampier and Exmouth - Review of shoreline sensitivity mapping. Review of Tactical Response Plans (TRPs) and development of additional TRPs for key locations An additional Control Measure was accepted: - To develop a list of small vessel providers in the Exmouth, Dampier and Port Hedland region Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in the OPEP. 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.							
Protection and deflection- booms and ancillary equipment	Level 2: Shoreline and nearshore booms plus ancillary equipment from Varanus Is. (Santos WA, 8*Beach Guardian, 16*25m Zoom Boom, 2*skimmer), Exmouth (AMOSC, 20*25m Beach Guardian, 20*25m Zoom Boom, 2 skimmers), Dampier (Santos WA, 1*skimmer; AMSA, 5* Canadyne Inflatable, 10* Structureflex Inflatable, 5* Versatech Zoom Inflatable, 2 Slickbar Solid Buoyancy, 3*Structureflex Solid Buoyancy, 30* Structureflex Land Sea), Fremantle (AMOSC, 23*35m Beach Guardian, 30*25m Zoom Boom, 18* Curtain Boom, 1*skimmer; AMSA, 15*Structureflex Inflatable, 13*Versatech Zoom Inflatable, 10*Structureflex Solid Buoyancy, 30* Structureflex Land Sea), Broome (AMOSC, various equipment). Vehicles sourced from local hire companies. Transit times (vessel): Varanus Is. to Exmouth = 18 hrs, Transit times (road) Fremantle to Exmouth = ~24 hrs Dampier/ Karratha to Exmouth = 7 hrs Exmouth to North West Cape = 0.5 hr. Protection booming equipment mobilised to FOB location within 12 hrs.	In effect	Equipment	Reduce hydrocarbon contact with coastal protection priorities. Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement; none identified	Costs associated with equipment purchase and maintenance Costs of contracts, MOUs with AMOSC and AMSA	In effect
	Level 3: Shoreline and nearshore booms plus ancillary equipment from Geelong (AMOSC), interstate (AMSA) and Singapore (OSRL). Transit times (road/ air) Geelong or Singapore to Exmouth or Karratha = 3–5 days. These resources in place to commence protection and deflection within 3-10 days.	In effect	Equipment	Reduce hydrocarbon contact with coastal protection priorities. Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement; none identified	Costs associated with equipment purchase and maintenance Costs of contracts, MOUs Costs associated with staff training	In effect
	Santos WA to purchase additional shoreline and nearshore booms and ancillary equipment	Additional	Equipment	Enable more protection and deflection operations to occur simultaneously to protect more key areas	Improved availability and reliability	Costs associated with equipment purchase and maintenance	Reject Sufficient quantities of equipment located in the region.

Protection and deflection- vessels	Level 1: Shallow draft vessels in use by Santos WA and located at (or in transit to) Ningaloo Vision, Exmouth, Dampier or Varanus Is. Boom deployment vessel / remote island transfer vessel mobilised to FOB location/ port within 12 hrs.	In effect	Equipment	Reduce hydrocarbon contact with coastal protection priorities. Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; early vessel availability	Cost of existing contracts with vessel providers	In effect
	Level 2: Shallow draft vessels sourced through Master Service Agreement, located in region	In effect	Equipment	Reduce hydrocarbon contact with coastal protection priorities. Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; vessel availability	Cost of vessel monitoring. Cost of contracts at the time of requirement.	In effect
	Level 3: Shallow draft vessels sourced without existing contracts from any location	In effect	Equipment	Reduce hydrocarbon contact with coastal protection priorities. Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; vessel availability	Cost of contracts at the time of requirement.	In effect
	Access to additional shallow draft boom tow vessels owned by Santos WA	Additional	Equipment	Faster response times to facilitate protection of key sensitive areas	Improved availability and reliability	Costs of vessel purchase and maintenance	Reject High numbers of shallow draft vessels located in the region. One vessel can help to set boom at multiple locations.
	Develop a list of small vessel providers in the Exmouth, Dampier and Port Hedland regions	Improved	Equipment	Reduce time required to source vessels and crew in initial phase of response. Improve mobilisation time, potential for response operations at more locations	Improved availability and reliability	Time involved in providing vessel specifications and liaising with existing suppliers	Reject
Protection and deflection- personnel	Level 2: Spill responders from Varanus Is., Devil Creek, Perth (Santos WA, 13 people), Fremantle (AMOSC staff, 2 people), Perth (AMOSC Core Group, up to 60 people). Santos Offshore Core Group mobilised to Exmouth within 12 hrs. AMOSC Staff and Industry Core Group mobilised to FOB within 24 hrs.	In effect	Personnel	Reduce hydrocarbon contact with coastal protection priorities Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Availability - Santos WA access to helo services ensures that regional personnel can be quickly mobilised to the appropriate location. Area for improvement; none identified	Costs of contracts, MOUs with AMOSC, AMSA Costs associated with staff training	In effect
Protection and deflection- personnel	Level 3: Spill responders from Geelong (AMOSC staff, 6 people), interstate (AMOSC Core Group, up to 60 people; AMSA, unspecified) and international (OSRL, 18 people). Interstate staff available from 2 to 3 days. OSRL staff initial 5 technical advisors available from 2 to 3 days, remaining personnel available from 4 to 5 days, subject to approvals/ clearances.	In effect	Personnel	Reduce hydrocarbon contact with coastal protection priorities Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement; none identified	Costs of contracts, MOUs with AMOSC, AMSA, OSRL Costs associated with staff training	In effect
	Ensure trained personnel based at strategic locations such as Dampier and Exmouth	Improved	Personnel	Faster response times to facilitate protection of key sensitive areas	Improved availability and reliability	Costs associated with staff employment and training	Reject No Santos personnel currently based at Exmouth so employment costs would be significant and not justified given that helicopters enable rapid transportation of Santos WA staff within the region.

Protection and deflection-planning	Ningaloo Coast shoreline sensitivity and access data/maps and Tactical Response Plans	In effect	Procedures	Reduce hydrocarbon contact with coastal protection priorities Consideration given to harmful impacts of boom, vessels, vehicles and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence	Cost of document preparation and maintenance	In effect
	Review of shoreline sensitivity mapping. Review of Tactical Response Plans (TRPs) and development of additional TRPs for key locations	Improved, additional	Procedures	Improved level of response planning to streamline resourcing and logistics and effect a better response	Improved functionality	Cost involved in revision of sensitivity mapping and tactical response plans and preparation of additional tactical response plans	Reject Current maps/plans are adequate to initiate an effective response. Plans will have to be reassessed at the time of the incident, to take into account variables such as weather and tides.

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcomes	Effectiveness	Feasibility	Accept/ Reject
ALARP Assessment Summary - Shoreline Cleanup 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 WA 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. The availability of labour hire personnel for initial stages of a response was identified as an area of improvement. Control Measures that were evaluated to improve the availability of labour hire was either not feasible or the cost was grossly disproportionate to the reduction in risk. The availability of shallow draft vessels in initial stages of a response was also identified as an area or improvement. A review of control measures associated with vessels identified that improvements could be made by adding a provision for shallow draft boom tow vessels in existing Master Service Agreements with vessel providers. Waste management may be a limiting factor for ongoing shoreline clean-up operations and further information is shown in the ALARP assessment for Waste. Ten potential Control Measures were identified and assessed. One Control Measure was accepted as reasonably practicable. The accepted response strategy was: - Provision for shallow draft vessels added to Master Service Agreement Nine Control Measures were rejected as grossly disproportionate. Rejected response strategies were: - Mechanical mobile plant equipment for clean-up pre purchased and positioned at strategic locations (Exmouth) - Prepurchase and storage of equipment (decontamination/ staging equipment, clean-up and flushing, PPE) at strategic locations (Exmouth) - Access to additional shallow draft vessels owned by Santos WA to transport personnel to key sensitive areas on offshore islands such as Murion Islands - Access to additional team leaders that are locally based at strategic locations (Exmouth) or can be mobilised within short time frames - Faster access to clean-up personnel via Perth based labour hire contractor - Faster access to clean-up personnel via locally based labour hire companies or emergency response organisations - Faster access to clean-up personnel via Santos employment of local personnel - 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 the OPEP. 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.							
Shoreline Clean-up - equipment	Level 1: Manual clean-up equipment from local hardware outlets. Decontamination/staging equipment from Exmouth (AMOSC, 1*decon station). Mobile plant from local hire companies. PPE from Exmouth (Santos WA, 1*container). Clean-up equipment mobilised to location within 12 hrs.	In effect	Equipment	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation of equipment in initial 48 hours of incident	Cost of equipment purchase and hire at the time of incident Cost of membership with AMOSC	In effect
	Level 2: Manual clean-up and flushing equipment from Varanus Is. (Santos WA, 1*container), Fremantle (AMOSC, 1*shoreline support kit and 1*flushing kit) and state hardware outlets. Decontamination/staging equipment from Karratha (AMSA; 2*decon stations) and Fremantle (AMOSC, 1*decon station; AMSA, 2* decon stations). Mobile plant from state hire companies. PPE from Dampier and Varanus Is (Santos WA, 2*containers) and Fremantle (AMOSC, 1*container, 2*gas detectors). Transit times (vessel): Varanus Is. to Exmouth = 18 hrs, Transit times (road) Fremantle to Exmouth = ~24 hrs Dampier/ Karratha to Exmouth = 7 hrs Resources in place to commence shoreline clean-up within 1–3 days	In effect	Equipment	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - procurement and mobilisation of equipment	Cost of equipment purchase and hire at the time of incident Cost of equipment purchase and maintenance Cost of contract with AMOSC	In effect

	Level 3: Manual clean-up and flushing equipment from Geelong (AMOSC, 1*shoreline support kit, 1* flushing kit, 1*shoreline impact lance kit), Singapore (OSRL) and national hardware outlets. Decontamination/ staging equipment from Geelong (AMOSC, 1*decon station). Mobile plant sourced from national hire companies. PPE from Geelong (AMOSC, 1*container, 7*gas detectors). Transit time (road/ air) Geelong or Singapore to Exmouth or Karratha = 3–5 days	In effect	Equipment	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - procurement and mobilisation of equipment	Cost of equipment purchase and hire at the time of incident Cost of equipment purchase and maintenance Cost of memberships with AMOSC and OSRL	In effect
	Mechanical mobile plant equipment for clean-up pre purchased and positioned at strategic locations (Exmouth)	Additional	Equipment	Environmental benefits and impacts are dependant on hydrocarbon fate and local ecology. Reduced mobilisation times and improved access would assist, should mobile plant be deemed advantageous	Improved availability and reliability	Costs associated with equipment purchase and maintenance	Reject there is a high likelihood that mobile plant equipment is not used due to negative environmental impacts, leaving purchased equipment unutilised and costs disproportionate Locally available hire plant can be used. Additional plant could be purchased and mobilised from Perth if required
	Prepurchase and storage of equipment (decontamination/ staging equipment, clean-up and flushing, PPE) at strategic locations (Exmouth)	Additional	Equipment	Improve mobilisation time, potential for more response locations	Improved availability and reliability	Cost in purchase and maintenance of equipment	Reject Equipment for first strike available at Exmouth. Additional equipment can be mobilised to Exmouth in less than 24 hours.
Shoreline Clean-up - vessels	Level 1: Shallow draft vessels in use by Santos WA and located at (or in transit to) Ningaloo Vision, Exmouth, Dampier or Varanus Is. Remote island transfer vessel mobilised to FOB location/ port within 12 hrs.	In effect	Equipment	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; early vessel availability	Cost of existing contracts with vessel providers	In effect
	Level 2: Shallow draft vessels sourced through Master Service Agreement, located in region and tracked by Santos WA Vessel Monitoring System	In effect	Equipment	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; vessel availability	Cost of vessel monitoring. Cost of contracts at the time of requirement.	In effect
	Level 3: Shallow draft vessels sourced without existing contracts from any location	In effect	Equipment	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; vessel availability	Cost of contracts at the time of requirement.	In effect
	Access to additional shallow draft vessels owned by Santos WA to transport personnel to key sensitive areas on offshore islands such as Murion Islands	Additional	Equipment	Faster response times to facilitate protection of key sensitive areas on offshore islands	Improved availability and reliability	Costs of vessel purchase and maintenance	Reject High numbers of shallow draft vessels located in the region. One vessel can help to set boom at multiple locations.

	Provision for shallow draft vessels added to Master Service Agreement	Improved	Equipment	Reduce time required to source vessels and crew in initial phase of response. Improve mobilisation time, potential for response operations at more locations	Improved availability and reliability. Improve capacity for Santos WA to source shallow draft vessels within the minimum arrival time of 4.3 days for Murion Is. and 9 days for Thevenard Is.	Time involved in providing vessel specifications and liaising with existing suppliers	Accept
Shoreline Clean-up - personnel	Level 2: Clean-up team leaders from Varanus Is., Devil Creek, Perth (Santos WA, 13 people), Fremantle (AMOSC staff, 2 people), Perth (AMOSC Core Group, up to 60 people). Santos Offshore Core Group mobilised to Exmouth within 12 hrs. AMOSC Staff and Industry Core Group mobilised to FOB within 24 hrs.	In effect	People	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation of personnel in initial 48 hours of incident	Costs associated with staff training Costs of membership, MoUs with AMOSC, AMSA	In effect
	Level 3: Clean-up team leaders from Geelong (AMOSC staff, 6 people), interstate (AMOSC Core Group, up to 60 people; AMSA, unspecified) and international (OSRL, 18 people). Interstate staff available from 2 to 3 days. OSRL staff initial 5 technical advisors available from 2 to 3 days, remaining personnel available from 4 to 5 days, subject to approvals/ clearances.	In effect	People	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation of personnel	Costs associated with staff training Costs of membership, MoUs with AMOSC, AMSA	In effect
	Access to additional team leaders that are locally based at strategic locations (Exmouth) or can be mobilised within short time frames	Additional	People	Improve mobilisation time, potential for more response locations	Improved availability and reliability	Cost of employment and training of staff Cost of being locally based or on a rapid mobilisation plan	Reject Santos WA already employs trained oil spill responders in the region that can be mobilised to key areas by helicopter within short time frames.
	Clean-up labour personnel predominantly based in Perth.	In effect	People	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation of personnel in initial 48 hours of incident	Costs of labour hire through existing service provider	In effect
	Faster access to clean-up personnel via Perth based labour hire contractor	Improved	People	Improve mobilisation time, potential for response operations at more locations	Improved availability and reliability	Not feasible to mobilise labour hire personnel in less than 72 hours	Reject
	Faster access to clean-up personnel via locally based labour hire companies or emergency response organisations	Improved	People	Improve mobilisation time, potential for response operations at more locations	Improved availability and reliability	No identified regional labour hire companies	Reject
	Faster access to clean-up personnel via Santos employment of local personnel	Improved	People	Improve mobilisation time, potential for response operations at more locations	Improved availability and reliability	Costs associated with personnel employment and training	Reject Cost of permanently employing personnel is grossly disproportionate to benefits of availability in initial
Shoreline Clean-up - planning	Shoreline sensitivity mapping and Tactical Response Plans	In effect	Procedures	Remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery. Consideration given to negative impacts of equipment and personnel on sensitive coastal ecology	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation in initial 48 hours of incident	Cost associated with development and maintenance of mapping and Tactical Response Plans	In effect
	Review of shoreline sensitivity mapping. Review of Tactical Response Plans (TRPs) and	Improved, additional	Procedures	Improved level of response planning to streamline resourcing and logistics and	Improved functionality	Cost involved in revision of sensitivity mapping and tactical response plans and	Reject Current maps/plans are adequate to

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcomes	Effectiveness	Feasibility	Accept/ Reject
ALARP Assessment Summary - Oiled Wildlife Oiled wildlife equipment including first strike kits and containers can be mobilised from regional locations and Perth. Further equipment is available through national or international resources to implement a timely and sustained response adequate for the scale of worst case oiled wildlife operations identified in the OPEP. The availability of trained personnel in the initial stages of an incident is a limiting factor for this response strategy. Control Measures around the provision of trained personnel were reviewed to identify that trained Santos WA personnel could be based not just in the Perth Office but also at VI and DC facilities. Potential Control Measures around additional responders through prehiring 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. An additional area of improvement is clarity for how Santos WA will integrate with Control Agencies OWR. It has been identified that additional planning captured in a Santos WA Oiled Wildlife Response Framework is a practicable control measure to ensure that resources are deployed in a coordinated Four potential Control Measures were identified and assessed. Two Control Measures were accepted as reasonably practicable. The accepted response strategies were: - Development of a Santos WA Oiled Wildlife Response Framework which will set the corporate guidance for OWR preparedness and response and define how Santos will integrate with Control Agencies to provide a coordinated response - Additional Santos WA OWR trained personnel positioned at VI and Perth Two Control Measures were rejected as grossly disproportionate. Rejected response strategies were: - Prehire and/or prepositioning of staging areas and responders - Direct contracts with service providers Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the OPEP. 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 a Performance Standards.							
Oiled wildlife response - planning	Implementation of the Western Australian Oiled Wildlife Response Plan (WAOWRP) and Pilbara Region Oiled Wildlife Response Plan	In effect	Procedure	Working within the guidelines of the WAOWRP and Pilbara regional plan will ensure a coordinated response and that the expectations of the Control Agency are met with the overall aim to increase the likelihood of success of the OWR (success in terms of wildlife survivorship and rates for release back into the wild).	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement- framework for how Santos will integrate with Control Agencies for OWR	Effort and time involved in developing OWR implementation plan within OPEP based on guidance from WAOWRP and Pilbara Regional Plan	In effect
	Development of a Santos WA Oiled Wildlife Response Framework which will set the corporate guidance for OWR preparedness and response and define how Santos will integrate with Control Agencies to provide a coordinated response	Additional	Procedure	The framework will be complementary to the WAOWRP and Pilbara Regional Plan and will facilitate a rapid coordinated response, and the provision of resources by Santos in order to increase the likelihood of success of the OWR.	Improved functionality and reliability.	Cost of document development and maintenance	Accept
Oiled wildlife response - equipment	Level 2 OWR kits and containers available from AMOSC, AMSA, DBCA or DoT in Exmouth, Darwin, Broome, Karratha, Fremantle, or Kensington. WA equipment (OWR containers) mobilised to Exmouth region within 24 hrs.	In effect	Equipment	Timely access to appropriate equipment is needed for the effective treatment of wildlife in order to increase the likelihood of success of the OWR	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of membership with AMOSC	In effect
	Level 3 OWR equipment available from OSRL. Transit times (road/ air) Singapore to Karratha = 3–5 days.	In effect	Equipment	Appropriate equipment is needed for the effective treatment of wildlife in order to increase the likelihood of success of the OWR	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of membership with OSRL	In effect
No alternate, additional or improved control measures identified							
Oiled wildlife response - personnel	Level 1/2 Santos WA personnel trained in OWR. OWR trained personnel mobilised to Exmouth region within 24 hrs.	In effect	People	Timely access to skilled personnel will enhance the likelihood of success of an OWR.	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; ensure personnel are based not just in the Perth Office but also at VI and DC facilities	Cost of training and maintaining training	In effect

	Level 2 OWR personnel from AMOSC, AMOSC-activated Wildlife Response contractors, and Industry Mutual Aid. Mobilisation of OWR personnel to site will start to occur in 24-48 hours following notification of actual or imminent impact to wildlife.	In effect	People	Timely access to skilled personnel will enhance the likelihood of success of an OWR.	Provides functionality, availability, reliability, survivability, compatibility and independence Area for improvement - availability - rapid mobilisation of personnel in initial 48 hours of incident	Cost of membership with AMOSC	In effect
	Level 3 OWR personnel available through OSRL. OSRL staff initial 5 technical advisors available from 2 to 3 days, remaining personnel available from 4 to 5 days, subject to approvals/ clearances.	In effect	People	Access to skilled personnel will enhance the likelihood of success of an OWR.	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of membership with OSRL	In effect
	Maintain labour hire arrangements for access to untrained personnel. Untrained personnel accessed through labour-hire arrangements would receive an induction, on-the-job training and work under the supervision of an experienced supervisor.	In effect	People	During a large scale OWR the ability to access large numbers of personnel through labour hire arrangements is imperative in terms of capability for conducting an OWR.	Provides functionality, availability, reliability, survivability, compatibility and independence	Cost of labour hire at time of incident	In effect
	Additional Santos WA OWR trained personnel positioned at VI and Perth	Additional	People	Additional personnel trained in OWR and whom are located at facilities will enhance the first strike capability of Santos WA and therefore enhance the likelihood of success of the OWR, particularly for those instances where oil is ashore within 48 hours	Improved functionality, availability, reliability and independence.	Cost of training staff	Accept
	Prehire and/or prepositioning of staging areas and responders	Additional	System	This may enhance response times and first strike capability and hence improve the likelihood of success of the OWR. Conversely, prepositioned personnel and	Improved functionality, availability, reliability and independence.	Additional wildlife resources could total $1500 per operational site per day. This is a guaranteed cost regardless of whether a spill occurs or not.	Reject- the cost of setting up staging areas and having responders on standby is considered disproportionate to the environmental
	Direct contracts with service providers	Alternative	System	This option duplicates the capability accessed through AMOSC and OSRL and would complete for the same resources without providing a significant environmental benefit	Does not improve effectiveness	Cost of contract	Reject- this option is not adopted as the existing capability meets the need.

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcome	Effectiveness	Feasibility	Accept/ Reject
ALARP Assessment Summary - Waste The Santos WA contract with the waste service provider has provisions for waste management operations of the scale estimated to be required in worst case scenarios detailed in the OPEP. Further detail is captured in the Waste Management Plan - Oil Spill Response Support (QE-91-IF-10053). The waste service provider can mobilise waste receptacles to Exmouth and Port Hedland from Karratha within 12 hrs. Given the waste service provider arrangmeents 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. One potential Control Measure to address this area of improvement was identified and assessed but cost was grossly disproportionate to risk. No other potential control measures were identified. Three potential Control Measures were identified and assessed. No Control Measure were accepted as reasonably practicable. Three Control Measures were rejected as grossly disproportionate. Rejected response strategies 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 the OPEP. 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.							
Waste Management	Waste management sourced through contract with waste service provider. Contract with waste service provider to be maintained and periodically reviewed. Waste service provider waste receptacles mobilised to Exmouth and Port Hedland from Karratha within 12 hrs for containment and recovery, protection and deflection and shoreline clean-up response strategies.	In effect	System	Timely and efficient handling of waste will reduce environmental impacts of waste and waste management. Consideration given to risks of secondary contamination.	Provides functionality, availability, reliability, survivability, compatibility and independence. Area of improvement; none identified	Cost of contract	In effect
	Maintain contracts with multiple service providers	Additional	System	Contract with additional waste service provider will not provide an additional environmental benefit as there are two major service providers in the region and reciprocal arrangements facilitate access to equipment of both.	Provides functionality, availability, reliability, survivability, compatibility and independence.	Significant additional cost in maintaining two contracts for the same service	Reject
	Temporary waste storage capacity available through waste service provider, AMOSC, AMSA, OSRL stockpiles	In effect	Equipment	Timely and efficient handling of waste will reduce environmental impacts of waste and waste management. Consideration given to risks of secondary contamination.	Provides functionality, availability, reliability, survivability, compatibility and independence. Area of improvement; none identified	Costs of contracts, MOU with waste service provider, AMOSC, AMSA and OSRL	In effect
	Procure temporary waste storage for Santos stockpile	Additional	Equipment	Additional storage available if required. Tanks may be stored in geographic locations that may reduce mobilisation times and allow faster collection and storage of waste. Additional storage may facilitate continuous collection operations to occur.	Provides functionality, availability, reliability, survivability, compatibility and independence	Additional cost in purchase and maintenance of tanks	Reject Purchasing this equipment for Santos stockpile is surplus to Santos requirements as AMOSC, AMSA, OSRL provides this equipment in strategic locations. Reduced mobilisation time is not an advantage, as waste storage can be mobilised at the same time as collection response strategies, and no waste needs to be stored prior to collection commenced.
	Vessels for waste transport through Santos contracted providers. To minimise vessel decontamination requirements, larger vessel will remain on station whilst smaller vessel will transport waste to Dampier.	In effect	Equipment	Timely and efficient handling of waste will reduce environmental impacts of waste and waste management. Consideration given to risks of secondary contamination.	Provides functionality, availability, reliability, survivability and compatibility. Area of improvement; dependence and availability of vessels	Contract with vessel contractors to be maintained and periodically reviewed	In effect

	Contract additional vessels on standby for waste transport	Additional	Equipment	Reduce delays in transportation of waste, particularly greater capacity for containment and recovery in the initial 2-	Provides functionality, availability, reliability, survivability, compatibility and dependence	Cost in contracting vessels to remain on standby for incident waste requirements	Reject Expense of maintaining vessels on standby that are surplus to day to day
	Vessel to vessel waste transfer plan gives details of waste storage requirements and procedures	In effect	Procedure	Allows effective use of available vessels and minimises vessel decontamination requirements	Provides functionality, availability, reliability, survivability, compatibility and independence.	Cost of documentation development, implementation, maintenance and exercising	In effect
	Decanting oily water, by returning into boomed area, to be undertaken subject to necessary approvals from AMSA or DoT	In effect	System, Procedure	Allows more effective handling, transportation and disposal of concentrated wastes	Provides functionality, availability, reliability, survivability, compatibility and independence.	Effort to obtain and adhere to approvals	In effect

Strategy	Control Measure	Alternative, Additional, Improved	Control Measure Category	Environmental Outcomes	Effectiveness	Feasibility	Accept/ Reject
ALARP Assessment Summary - Scientific Monitoring Oil spill scientific monitoring will be conducted on behalf of Santos WA 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. Additionally, three potential Control Measures were identified and assessed. A potential Control Measure on the purchase and standby of scientific monitoring resources was found to be grossly disproportionate in cost in comparison to the reduction in risk. Two potential Control Measures on improved record keeping for scientific monitoring consumable requirements and suppliers and the provision of water quality sampling kits to be located at strategic regional locations were both found to be reasonable practicable Four potential Control Measures were identified and assessed. Three Control Measure were accepted as reasonably practicable. The accepted response strategies were: - Maintain equipment list and list of suppliers for implementation of Scientific Monitoring Plans - Before planned activities commence, purchase of oil/water quality sample kitsfor scientific monitoring personnel to be positioned at Varanus Is., Exmouth and Dampier - Determine required vessel specifications required for Scientific Monitoring implementation and improve accuracy of Vessel Tracking Systen One Control Measure was rejected as grossly disproportionate. Rejected response strategy was: - Scientific monitoring personnel, plant and equipment on standby at the operational location Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the OPEP. 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							
Scientific Monitoring - monitoring service provider and equipment	Maintenance of Monitoring Service Provider contract for scientific monitoring services and annual review of standby manual. SMP provider and monitoring equipment mobilised to site within 72 hrs.	In effect	System	This is the main tool for determining the extent, severity and persistence of environmental impacts from an oil spill and allows operators to determine whether their environmental protection outcomes have been met (via scientific monitoring activities). It is used to inform areas requiring rehabilitation. This strategy also evaluates the recovery from the spill.	Provides functionality, availability, reliability, survivability, compatibility and independence Area of improvement; none identified	Cost of contract with Scientific Monitoring Service Provider	In effect
	Regular capability reports from Monitoring Service Provider shows personnel availability and annual reviews of standby manual	In effect	System	This ensures the Monitoring Service Provider has the capability to undertake Scientific Monitoring, including, post-spill preimpact surveys within the EMBA of receptors with deficient baseline data	Improves functionality, availability and reliability	Cost of contract with Scientific Monitoring Service Provider	In effect
	Conduct periodical review of existing baseline data sources across the Santos WA combined EMBA	In effect	System	This ensures that receptors within the EMBA with deficient baseline data are identified	Improves functionality and provides compatibility	Cost of contract with Scientific Monitoring Service Provider	In effect
	Scientific monitoring personnel, plant and equipment on standby at the operational location	Additional	People, equipment	Improve mobilisation time	Improved availability and reliability	Cost would be in excess of $1 mil annually	Reject- cost of control measure is disproportionate to the environmental benefit
	Maintain equipment list and list of suppliers for implementation of Scientific Monitoring Plans	Improved	Procedure	Improve response time	Improved functionality, availability and reliability	Cost of contract with Scientific Monitoring Service Provider	Accept
	Purchase of oil/water quality sample kits in 2020 for scientific monitoring personnel to be positioned at Varanus Is., Exmouth and Dampier	Improved	Equipment	Improve response time	Improved availability and reliability	Cost associated with purchase of equipment and maintenance	Accept
Scientific Monitoring - vessels	Level 2: vessels sourced through Master Service Agreement, located in region and tracked by Santos WA Vessel Monitoring System. Santos to mobilise monitoring vessels to	In effect	Equipment	Improve response time	Provides availability and reliability	Effort associated with maintaining MSA	In effect

	Level 3: vessels sourced without existing contracts from any location	In effect	Equipment	Reduce the volume of surface hydrocarbons to reduce contact with protection priorities.	Provides survivability, compatibility and independence. Area of improvement; functionality, availability and reliability of tow vessels.	Cost of contracts at the time of requirement.	In effect
	Determine required vessel specifications required for Scientific Monitoring implementation and improve accuracy of Vessel Tracking System	Improved	Procedure	Improve mobilisation time	Increase in availability and reliability	Effort to determine vessel specifications and improve tracking	Accept

Appendix C: POLREP

Department of **Transport**

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.
To post the form please click on the "POST" button opposite.

POST Reset Form

mep_polrep_0815

Appendix D: SITREP

Marine Pollution Situation Report (SITREP)

Send completed form to:
Maritime Environmental Emergency Response
Department of Transport
PO Box 402 Fremantle , 6159
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:

SITREP **Prepared By**	Name:	
	Agency:	
	Role:	
	Contact	Telephone
		Fax
		Mobile
	No of Pages Attached:	

To post the form please click on the "POST" button below

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RESET

MEP_Sitrep_1114

Appendix E: Vessel Surveillance Observer Log

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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

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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:

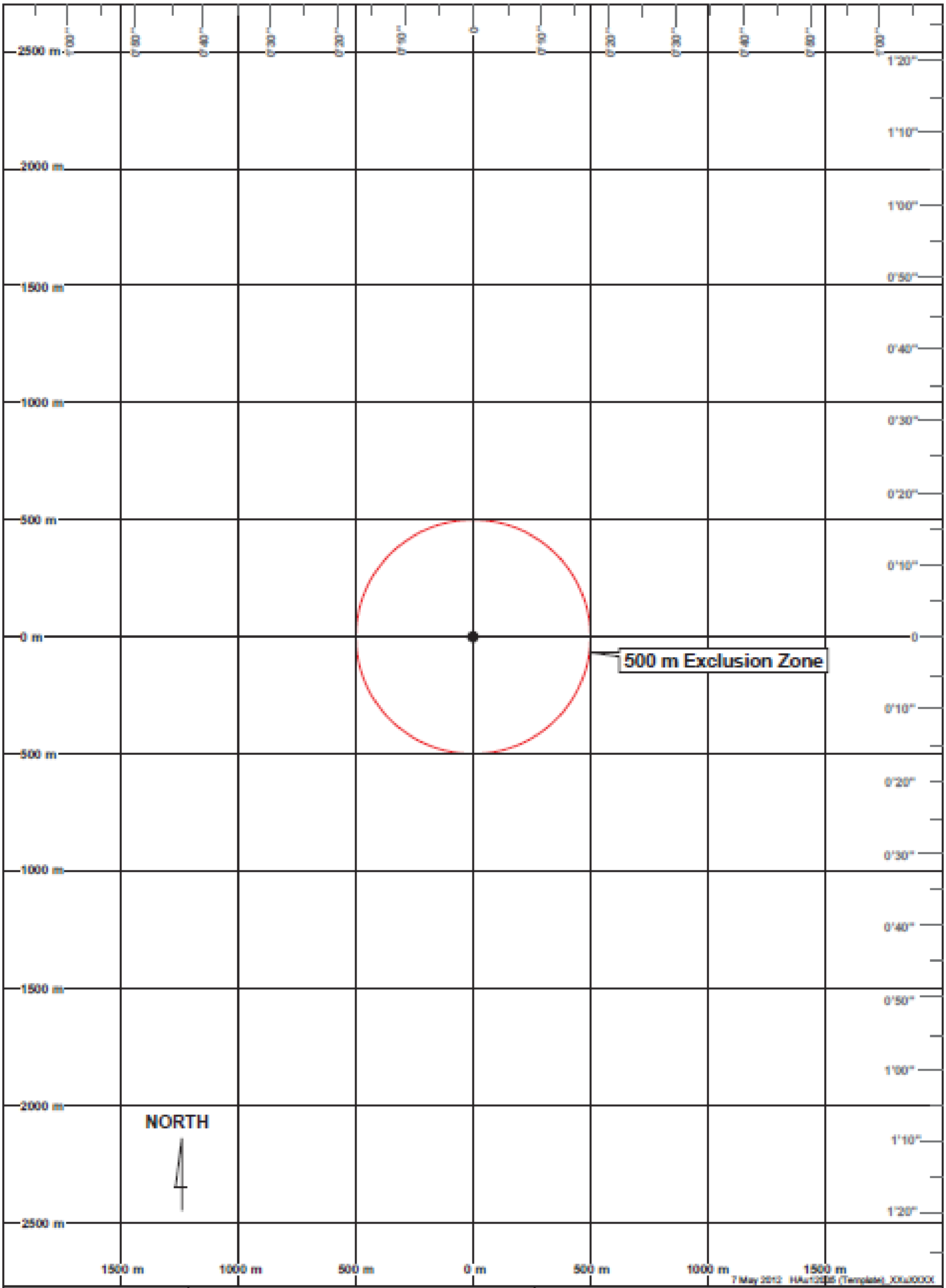
Weather Conditions	
Wind speed (knots)	Wind direction
Cloud base (feet)	Visibility
Time high water	Current direction
Time low water	Current speed (nM)

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

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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

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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					

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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

<u>Observer Name</u>	<u>Observer signature</u>	**Observer** ◯ Inexperienced ◯ Experienced

Appendix I: Aerial Surveillance Shoreline Observation Log

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Aerial Surveillance Reconnaissance Log – Oil Spill

<table>
<tr><td colspan="12">Survey Details</td></tr>
<tr><td colspan="2">Incident:</td><td colspan="2">Date:</td><td colspan="2">Start time:</td><td colspan="2">End Time:</td><td colspan="4">Observer/s:</td></tr>
<tr><td colspan="12">Area of Survey</td></tr>
<tr><td colspan="6"><u>Start GPS</u>
LATITUDE:

LONGITUDE:</td><td colspan="6"><u>End GPS</u>
LATITUDE:

LONGITUDE:</td></tr>
<tr><td colspan="2">Aircraft type</td><td colspan="4">Call sign</td><td colspan="3">Average Altitude</td><td colspan="3">Remote sensing used (if any)</td></tr>
<tr><td colspan="12">Weather Conditions</td></tr>
<tr><td colspan="4">Sun/Cloud/Rain/Windy</td><td colspan="4">Visibility</td><td colspan="4">Tide Height
L/M/H</td></tr>
<tr><td colspan="4">Time high water</td><td colspan="4">Time low water</td><td colspan="4">Other</td></tr>
<tr><td colspan="12">Shoreline Type - Select only ONE primary (P) and ANY secondary (S) types present</td></tr>
<tr><td></td><td colspan="3">Rocky Cliffs</td><td></td><td colspan="3">Boulder and cobble beaches</td><td></td><td colspan="3">Sheltered tidal flats</td></tr>
<tr><td></td><td colspan="3">Exposed artificial structures</td><td></td><td colspan="3">Riprap</td><td></td><td colspan="3">Mixed sand and gravel beaches</td></tr>
<tr><td></td><td colspan="3">Inter-tidal platforms</td><td></td><td colspan="3">Exposed tidal flats</td><td></td><td colspan="3">Fine-Medium sand grained beaches</td></tr>
<tr><td></td><td colspan="3">Mangroves</td><td></td><td colspan="3">Sheltered rocky shores</td><td rowspan="2"></td><td colspan="3" rowspan="2">Other</td></tr>
<tr><td></td><td colspan="3">Wetlands</td><td></td><td colspan="3">Sheltered artificial structures</td></tr>
<tr><td colspan="12">Operational Features (tick appropriate box)</td></tr>
<tr><td></td><td colspan="3">Direct backshore access</td><td></td><td colspan="3">Alongshore access</td><td></td><td colspan="3">Suitable backshore staging</td></tr>
<tr><td colspan="12">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 1**.

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

Table 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.	-
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.	-

Sensitive Receptors	Strategy Guidance	
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.	-

Sensitive Receptors	Strategy Guidance	
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.	-

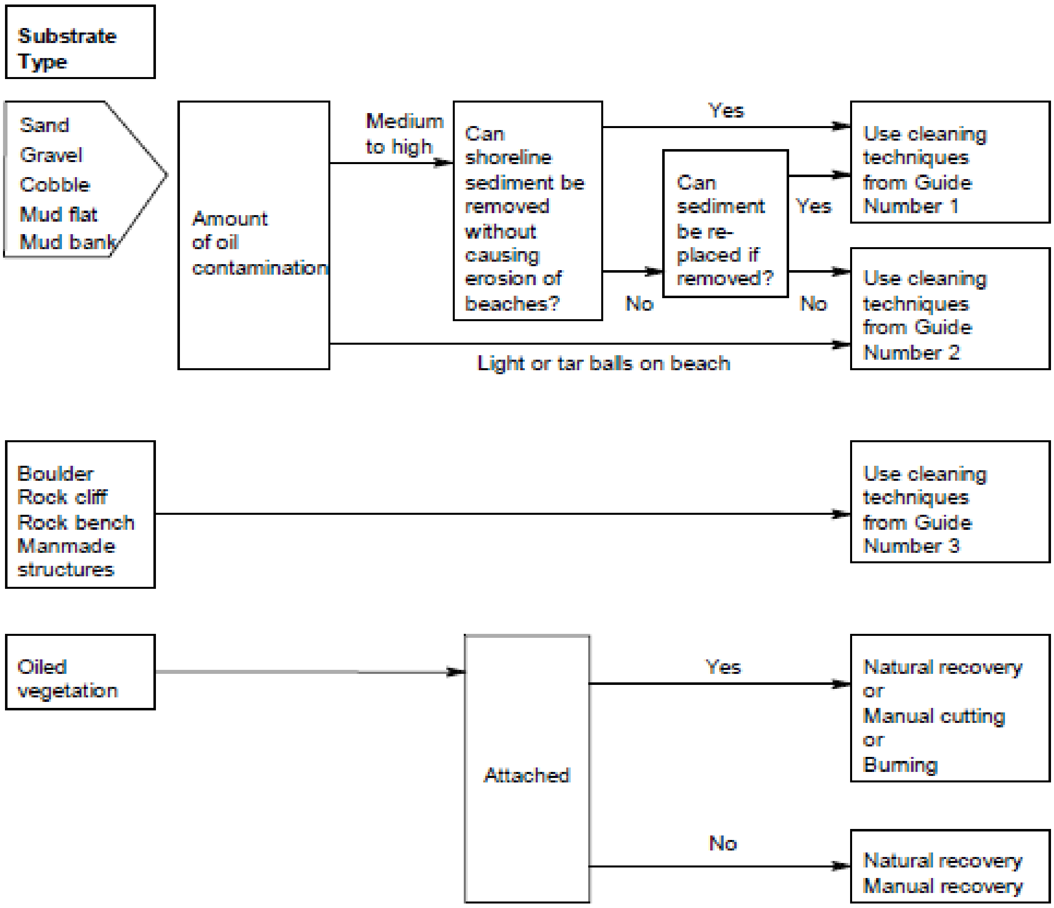

Figure 1: Shoreline Clean-up Master Decision Guide

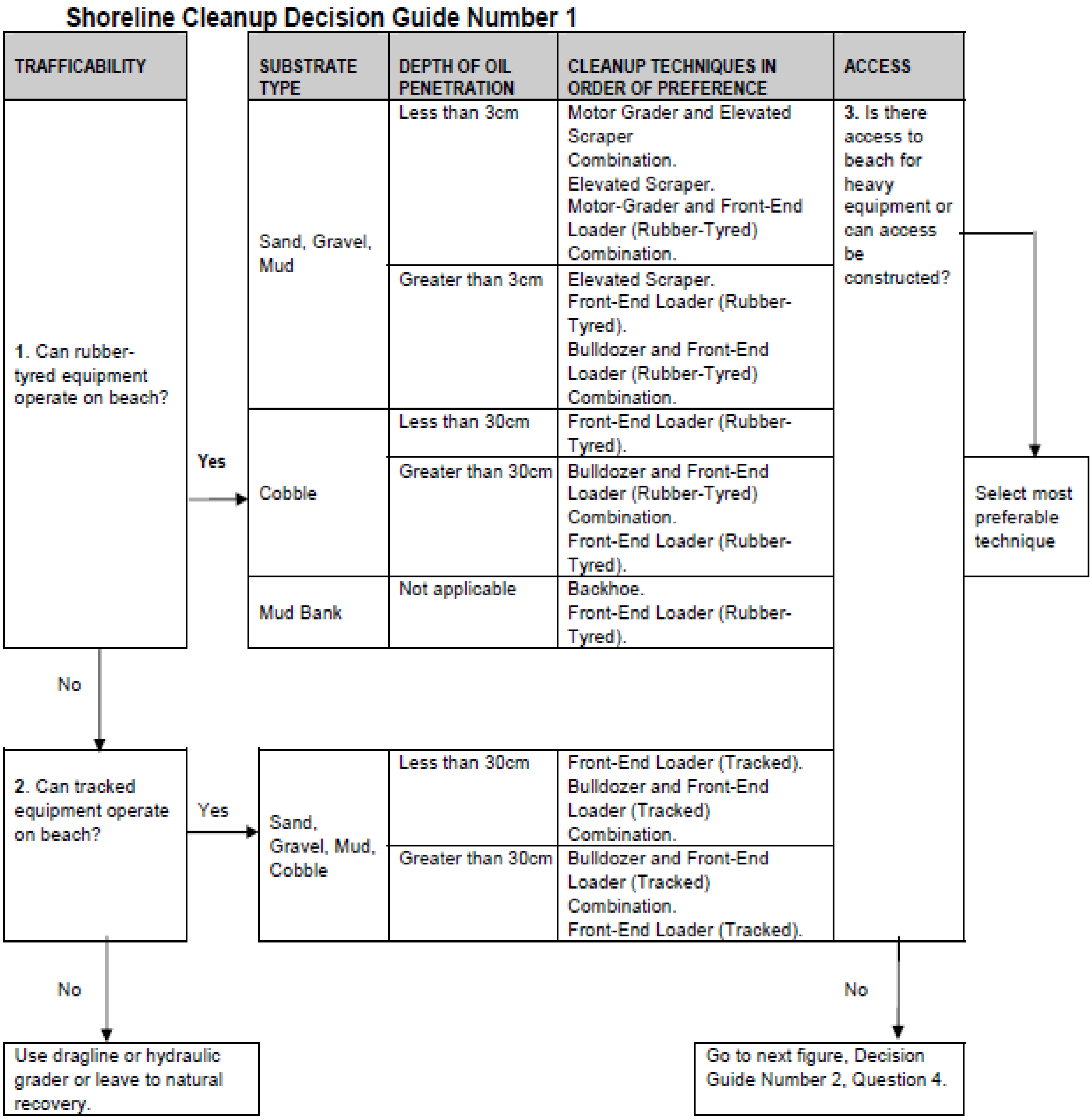

Figure 2: Shoreline Clean-Up Decision Guide 1

Shoreline Cleanup Decision Guide Number 2

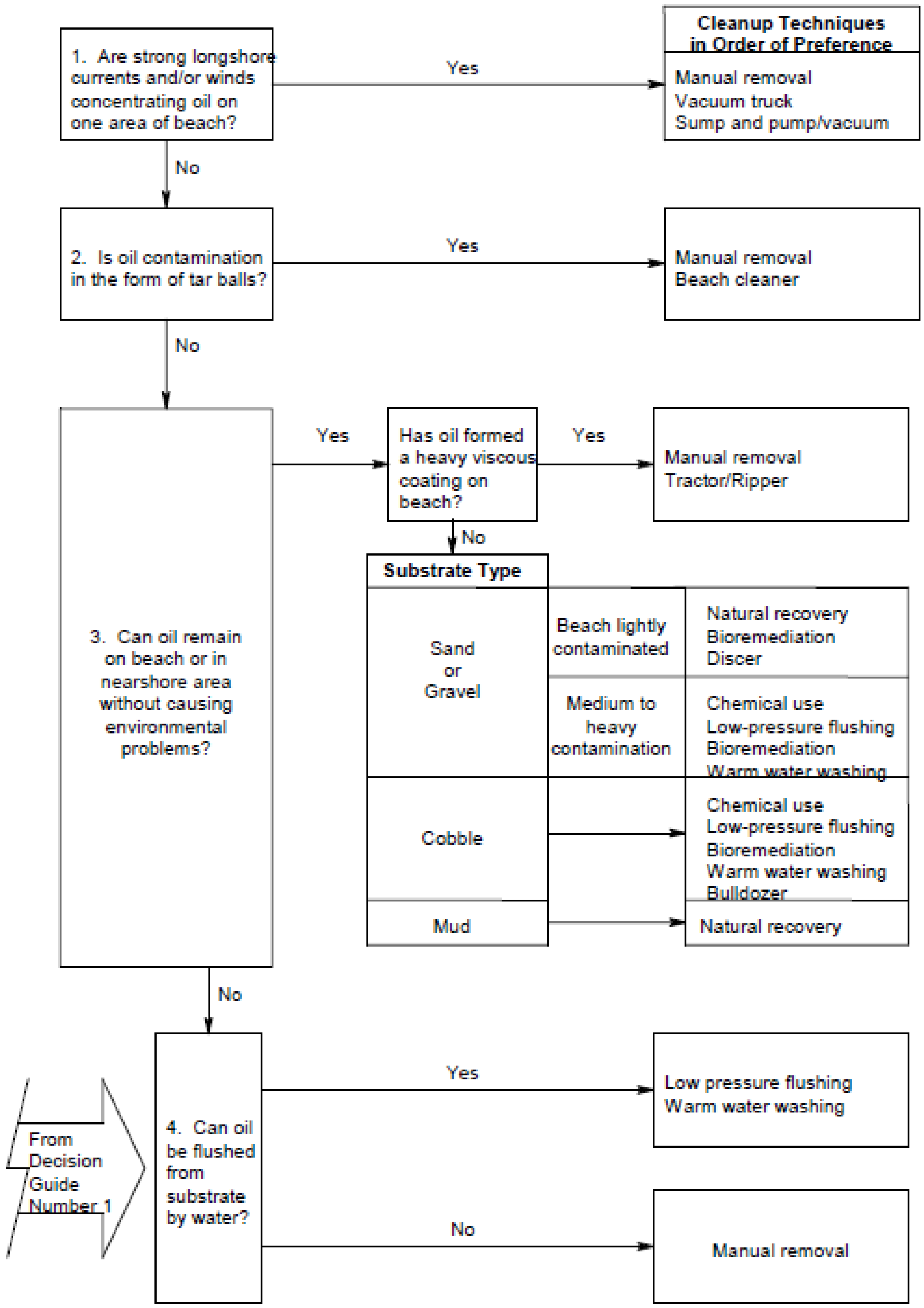

Figure 3: Shoreline Clean-Up Decision Guide 2

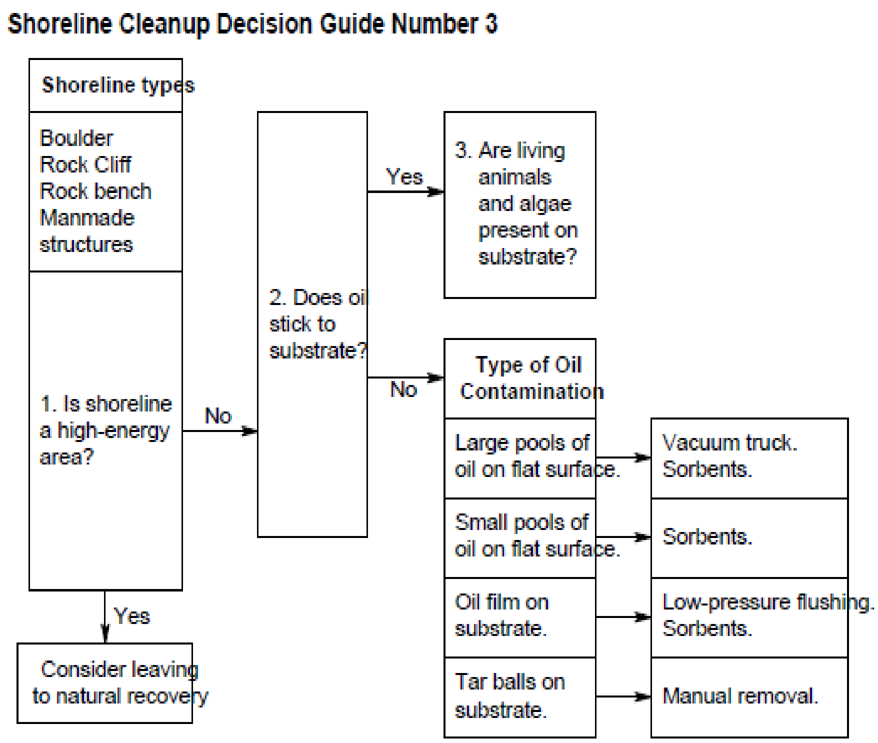

Figure 4: Shoreline Clean-Up decision Guide 3

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 ✓ Barrier tape and stakes ✓ Signposting equipment	✓ Bins, barrels, skips, tanks ✓ Hot and cold beverages Welfare) ✓ Cooking oil, soap (Welfare) ✓ Earthmoving equipment

PRIMARY STORAGE OF WASTE

A primary storage site is:

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

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

The return of the site to its original condition implies:

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

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

Primary waste storage sites should meet certain criteria:

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

- ✓ Depending on the volume of waste, site characteristics and availability of containers, prepare:
  - 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 WA 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 Pilbara Region OWR Plan provide detail of local organisations and suppliers for personnel and equipment.

In addition to OWR providers mobilised through AMOSC and OSRL/Sea Alarm, Santos WA 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 WA's 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 Pilbara Region OWR Plan 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

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

Perth Zoo – Duty Veterinarian	advice, expertise and management 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 June 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	ion
1 x NatPlan OWR container 1 x NatPlan/DBCA Box/trailer kit	AMSA RCC	Dampier
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 Cleaning and rehabilitation response package	OSRL Duty Officer	UK
1 x Search and rescue response package 1 x Cleaning and rehabilitation response package		Singapore
1 x Search and rescue response package 1 x Cleaning and rehabilitation response package		Bahrain

1 x Wildlife Rehabilitation Unit 1 x Cleaning and rehabilitation response package		Fort Lauderdale, USA

* As per AMOSC Capacity Statement 25 June 2020

** As per OSRL SLA Equipment Report 1 Dec 2020.

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: 1. Environmental covariates are considered in sampling design recorded and incorporated statistically. 2. A hierarchical or stratified sampling design is used to address variation at multiple scales 3. Design is standardized, by sampling equivalent strata (e.g., level of exposure, depth etc.).	English et al. (1997), Snedecor and Cochran (1989)
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)

Principle	Explanation	Key guiding references
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)

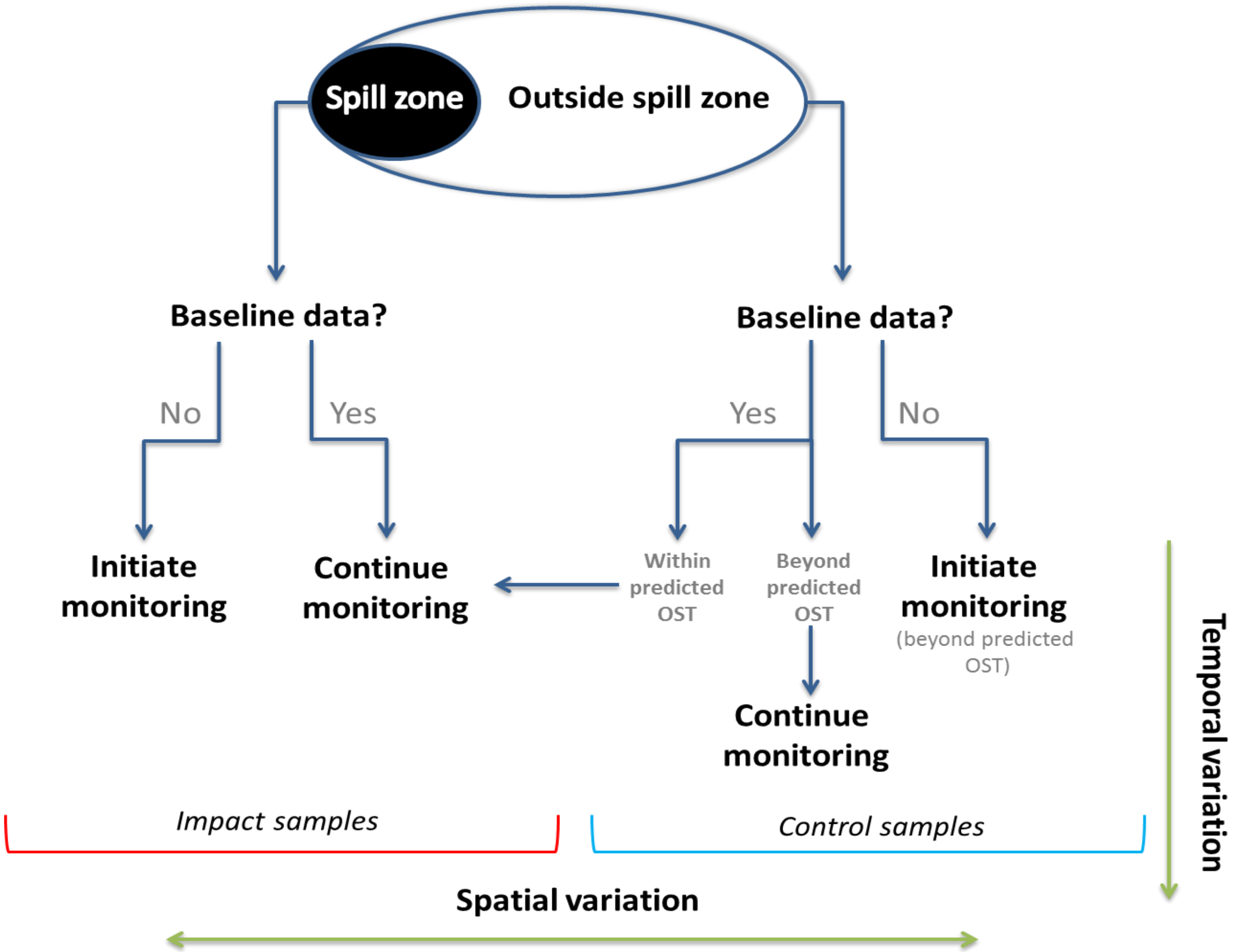

Figure 1: Structured decision making process based on Gregory et al. (2012) in reference to monitoring programs, the availability of baseline data, and oil spill trajectory. In an ideal design sampling would occur across a gradient of exposure rather than 'impact' and 'control' per se.

1.2 Data Analysis

The most important approaches to statistical analysis and related sampling design are summarised in Table 2 (below).

Table 2: Summary of data analysis techniques.

Analysis type		Description	Strengths	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.
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.

2 Scientific Monitoring Plans by Receptor

2.1 SMP1 Marine Water Quality

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 Monitor and Evaluate, to inform the sampling design of other SMPs where objectives are to evaluate impact 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 Baseline Data Review (QE-00-BI-20001) In addition, the Industry-Government Environmental Metadatabase (IGEM) (Santos is subscribed to) 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.

<table>
<tr><th colspan="2">SMP1 – Marine Water Quality</th></tr>
<tr><td>Methodological approach</td><td>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):
4. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied;
5. 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;
6. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied.

See 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>

A water quality probe will be used to measure conductivity (to derive salinity), temperature and depth (CTD), dissolved oxygen (% and mg/L), turbidity, total dissolved solids 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).</td></tr>
<tr><td>Scope of works</td><td>Prepared by monitoring provider for issue within 24 hours of SMP having been activated.</td></tr>
</table>

SMP1 – Marine Water Quality	
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.

2.2 SMP2 Sediment Quality

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.
Baseline	Refer Baseline Data Review (QE-00-BI-20001) In addition, the IGEM 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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.

SMP2 - Sediment Quality	
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 • Shading from marine infrastructure • Climate change

SMP2 - Sediment Quality	
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): 7. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied; 8. 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; 9. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied. See 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 extend 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. 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 (buffered formalin, formaldehyde or 70% ethanol) 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.

SMP2 - Sediment Quality	
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP having been activated.
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 of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.3 SMP3 Sandy Beaches and Rocky Shores

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 Baseline Data Review (QE-00-BI-20001) In addition, the IGEM shall be reviewed for applicable rocky shoreline and sandy beach biota baseline data. Minimal baseline data currently exists for rocky shorelines and sandy beaches.
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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.

SMP3 - Sandy Beaches and Rocky Shores	
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 • Over-collection • Nutrification • Climate change.

<table>
<tr><th colspan="2">SMP3 - Sandy Beaches and Rocky Shores</th></tr>
<tr><td>Methodological approach</td><td>Monitoring will be designed as follows:

• Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied.
• Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied.
• 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 (buffered formalin, formaldehyde or 70% ethanol) 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.</td></tr>
<tr><td>Scope of works</td><td>Prepared by monitoring provider for issue within 24 hours of SMP being activated.</td></tr>
<tr><td>Implementation</td><td>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.</td></tr>
</table>

SMP3 - Sandy Beaches and Rocky Shores	
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.

2.4 SMP4 Mangrove Communities

SMP4 - Shorelines and Coastal Habitats – Mangroves	
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.
Aim	To monitor changes to mangrove extent and health in relation to an oil spill and associated activities.
Baseline	On-ground monitoring is ongoing at several locations , refer Baseline Data Review (QE-00-BI-20001). Santos holds long term data from field mangrove health surveys at Varanus Island/ Bridled Island (Lowendal Group). 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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.
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.

SMP4 - Shorelines and Coastal Habitats – Mangroves	
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 onground monitoring should be carried out to complement any analysis of remote sensing. Analysis of long-term onground monitoring data will be as follows: • Where long-term baseline data sites (only) are contacted a control chart (time-series) design will be applied. • Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. • Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied (See Figure 1). 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 at Varanus Island (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 works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
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.

2.5 SMP5 Intertidal Mudflats

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 penetrating oil. At high tide, these habitats become foraging grounds for vertebrates such as rays and sharks. While there is some localised disturbance, most of the communities in the area of interest are generally in an undisturbed condition. 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 Baseline Data Review (QE-00-BI-20001) . In addition, the IGEM 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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.
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.

SMP5 - Shorelines and Coastal Habitats – Intertidal Mudflats	
Methodological approach	Monitoring will be designed as follows: • Where long-term baseline data sites (e.g., Roebuck Bay) are contacted, a control chart (time-series) design will be applied. • Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. • Where no baseline data sites are involved a post-spill pre-impact (preferable) or gradient approach to quantifying impacts will be applied (See Figure 1). 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, formaldehyde or 70% ethanol) 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 works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
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 in order 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.

2.6 SMP6 Benthic Habitats

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 which 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 living. 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 EMBA and are generally considered to be in good condition.
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 Baseline Data Review (QE-00-BI-20001) In addition, the IGEM will be reviewed for applicable benthic habitat and coral health and reproduction baseline data. Remote sensing data, satellite and aerial imagery previously acquired (for example Hyperspectral imagery along the Ningaloo lagoon) (Kobryn et al. 2013) 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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.

<table>
<tr><th colspan="2">SMP6 - Benthic Habitats</th></tr>
<tr><td>Termination criteria</td><td><u>Benthic habitat cover and composition</u>

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.

<u>Coral health and reproduction</u>

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.</td></tr>
<tr><td>Receptor impact</td><td>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.</td></tr>
</table>

<table>
<tr><th colspan="2">SMP6 - Benthic Habitats</th></tr>
<tr><td>Methodological approach</td><td>Monitoring design will be as follows:
• Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied.
• Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied.
• Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied.

<u>Benthic Habitat Cover and Composition</u>
Field survey methodology will be based upon acquiring repeat digital imagery (video or still images) of benthic habitats along fixed 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.
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 will 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, ecotox 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.</td></tr>
<tr><td>Scope of works</td><td>Prepared by monitoring provider for issue within 24 hours of SMP being activated.</td></tr>
<tr><td>Implementation</td><td>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.</td></tr>
</table>

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 ecotox laboratory in addition to standard suite of ecotox tests using released hydrocarbon. 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 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.

2.7 SMP7 Seabirds and Shorebirds

SMP7 - Seabirds and Shorebirds	
Rationale	The region supports around 25 species of migratory shorebirds, 20 species of resident shorebirds, and approximately 30 species of seabirds. Shorebird foraging is most highly concentrated on tidal mudflats, while seabirds tend to nest on offshore islands. Impacts to seabirds and shorebirds due to the presence of surface, entrained and dissolved hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical (e.g. matting of feathers, inability to fly). These effects may ultimately lead to death or failed breeding. 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. 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 Baseline Data Review (QE-00-BI-20001) The Oil Spill Response Atlas (Department of Transport (DoT)) and National Conservation Values Atlas (Department of the Environment and Energy - http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) should also be consulted. Long-term seabird monitoring has been conducted on Lowendal, Airlie and Serrurier Islands by Santos as part of seabird and shearwater monitoring programs.
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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.
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 (DBCA and/or DoEE).

SMP7 - Seabirds and Shorebirds	
Receptor impact	Impact to sea and shore birds 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.
Methodological approach	Monitoring design will be as follows: • Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. • 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. • Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied. 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 conducted in the area, such as Bamford and Moro (2011) at Barrow Island, and survey guidelines standardised by the 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 works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
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). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.

SMP7 - Seabirds and Shorebirds	
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.

2.8 SMP8 Marine Megafauna

SMP8 - Marine Megafauna	
Rationale	Thirty-eight species of marine mammals are known to occur within the region. These include cetaceans (whales and dolphin) and sirenians (dugong). The whale shark (*Rhincodon typus*) is also included within this plan. 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 and whale sharks that may have resulted from the hydrocarbon spill and associated response.
Baseline	Refer Baseline Data Review (QE-00-BI-20001)
Initiation criteria	Operational monitoring indicates that marine megafauna are contacted or predicted to be contacted by a hydrocarbon spill. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.

SMP8 - Marine Megafauna	
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 in the north-west of Western Australia; AND No further instances of dead marine megafauna with detectable levels of hydrocarbons attributable to the hydrocarbon spill; AND Monitoring is terminated in consultation with the relevant environmental authority (DBCA and/or DoEE).
Receptor impact	Impact to marine mammals and whale sharks 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) • Marine surveys will follow the protocols of Watson et al. (2009) 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 works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
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.

SMP8 - Marine Megafauna	
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 in the north west of Western Australia. 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.

2.9 SMP9 Marine Reptiles

SMP9 - Marine Reptiles	
Rationale	Six species of marine turtle, 22 species of sea snake and one species of estuarine crocodile are considered to occur within the region. 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. This plan is primarily focussed on marine turtles, while assessing other reptiles where encountered.
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 turtle populations in relation to an oil spill and associated activities.
Baseline	Refer Baseline Data Review (QE-00-BI-20001) The Oil Spill Response Atlas (Department of Transport (DoT)) and National Conservation Values Atlas (Department of the Environment and Energy - http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) should also be consulted.

SMP9 - Marine Reptiles	
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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.
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 (DBCA and/or DoEE).
Receptor impact	Impact to marine turtles from pressures including hydrocarbons is measured through change in: • Abundance • Health/condition • Nesting success. 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.

SMP9 - Marine Reptiles	
Methodological approach	**Abundance** In-water impacts – aerial surveys. Shoreline impacts – ground surveys (either rapid track 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) **Reproductive success** Shoreline impacts – ground surveys (detailed tagging and/or nesting success studies). Design of ground surveys for turtles will be applied as follows: • Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. • Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. • Where no baseline data sites are involved, and timing allows, a post spill pre-impact approach will be attempted • If a post-spill pre-impact approach is not practicable, a gradient approach to quantifying impacts will be applied
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
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.

SMP9 - Marine Reptiles	
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. 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 in the north-west of Western Australia. 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.

2.10 SMP10 Seafood Quality

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 Baseline Data Review (QE-00-BI-20001) 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 predicts or observes contact of oil to target species for consumption. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.

SMP10 - Seafood Quality	
Termination criteria	Hydrocarbon concentrations in the tissues of seafood are not above levels considered a human health risk from consumption; 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.
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), following the duo-trio method (Standards Australia 2005).
Scope of works	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
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.

SMP10 - Seafood Quality	
Analysis and reporting	Laboratories will be NATA-accredited for food standards analyses. Data will be stored in spatially explicit database and analysed in order 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.

2.11 SMP11 Fish, Fisheries and Aquaculture

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 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 Baseline Data Review (QE-00-BI-20001) In addition, the IGEM shall to 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. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.
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 Department of Primary Industries and Regional Development (DPIRD).

<table>
<tr><th colspan="2">SMP11- Fish, Fisheries and Aquaculture</th></tr>
<tr><td>Receptor impact</td><td>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
• Over fishing
• Introduction of marine pests
• Habitat disturbance
• Climate change.</td></tr>
<tr><td>Methodological approach</td><td>Fish assemblages will be assessed using the stereo-baited remote underwater videos (BRUVs) following Shortis et al. (2009). Fish assemblages will be randomly sampled within discrete habitats at cross-shelf impact areas and non-impact areas.

Sampling design for fish assemblages will be as follows:
• Where long-term baseline data sites are contacted a control chart (time-series) design will be applied.
• Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied.
• If baseline data is not available, a gradient approach to quantifying impacts will be applied (See Figure 1).

Where relevant, data available from DPIRD, 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.</td></tr>
<tr><td>Scope of works</td><td>Prepared by monitoring provider for issue within 24 hours of this SMP being activated.</td></tr>
<tr><td>Implementation</td><td>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.</td></tr>
</table>

SMP11- Fish, Fisheries and Aquaculture	
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. 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.

2.12 SMP12 Whale Shark

SMP12- Whale Shark	
Rationale	Whale sharks inhabit most of the Western Australian coast and seasonally aggregate at Ningaloo Reef in the austral autumn and winter, coinciding with a pulse of productivity following mass coral spawning in early autumn, with the population during this period dominated by juveniles (Bradley et al. 2016). In addition to the monitoring that will be undertaken as part of SMP8 Marine Megafauna, additional scientific monitoring of whale sharks along the Ningaloo Coast will be undertaken (SMP12). Santos has historically and currently supported research on the behaviour, demography and migration patterns of whale sharks at Ningaloo Reef. 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.
Aim	To quantify impacts of an oil spill on whale sharks at the Ningaloo Coast

Baseline	Baseline monitoring information of whale sharks includes: 1) Aerial survey. Monthly surveys funded by Woodside Energy were completed from 2000 to 2002. DEC undertook monthly surveys of Ningaloo Reef during the whale shark season from 2006 to 2010. The results of work funded by Woodside were published by Sleeman *et al*. (2010). Because whale sharks are not constrained to visit the surface in the same way as marine mammals, both surveys recorded relatively few whale sharks. Analysis of the DEC survey data by Professor Helene Marsh of James Cook University concluded its surveys did not account for problems of availability and perception errors and that due to the relatively low numbers of sharks available to be counted in the Ningaloo region, aerial survey was probably not an appropriate means to census these sharks (DEC pers. comm.). Note that while aerial survey techniques have shortfalls for determining abundance patterns, they are still useful for identifying aggregation sites of whale sharks in the Exmouth sub-basin. 2) Photo-identification databases. Two databases of whale sharks sighted at Ningaloo Reef are available although there is likely to be considerable overlap in their content. The first of these is held by AIMS and uses open-source software to compare and match images of sharks. Access to this database is not restricted. The second is held by Ecocean and requires user-access agreements to deposit, match and retrieve images or access metadata. The software used by Ecocean to compare images is proprietary. In the case of the AIMS database, images are available from 1992 to the present day with most of them provided by ecotourism operators at the end of each whale shark season. As part of licence agreements with DBCA, videographers working with each tourist operator must surrender footage of each shark encountered by the operator. DBCA staff then download id-images from these videos. Metadata and id-images are provided to both Ecocean and AIMS databases. These databases can be used in mark-recapture modelling frameworks to examine trends in the composition and abundance of whale sharks at Ningaloo, but outputs must be considered in the light of the caveats mentioned earlier (i.e. representativeness, sampling protocol etc.). 3) Operator and researcher trip logs. Each time a whale shark is encountered by a tourist and research vessel, or by a spotter plane, a record is kept of the location, size and sex (where possible) of the animal and the date and time. These records now exist from 1994 to the present day. These data suffer from the same caveats applicable to photo-id databases (e.g. representativeness of sampling of the entire population within the Exmouth region). Furthermore, planes do not search for animals in any formally structured manner, but rather fly up and down the reef at varying distances from the reef crest until a whale shark is sighted. If animals are sighted early in the day and all operators have completed tourist swims with sharks, then searches are terminated and the plane returns to base. Conversely, if whale sharks are difficult to find the area of search is widened and the plane will search for longer. Thus, the area and duration of searches can be highly variable. There have been changes in the format of reporting (written logs to GPS records) of encounters both by the boats and the planes through time. Finally, at times when there are few whale sharks, encounters with the same shark may be shared among tourist vessels, so that there is the possibility of double (or even triple) counting of the same shark in the database. Despite these problems, analysis of tourist industry databases have returned valuable insights into physical drivers of whale shark abundance at Ningaloo Reef (e.g. Sleeman *et al*., 2010) Other relevant baseline datasets include: 4) Sightings by the oil and gas industry. Occasional sightings of whale sharks either from the decks of oil rigs or by remotely operated vehicles (ROVs) around oil platforms and deepwater facilities have been compiled by AIMS for the past six years. No formal sampling program exists and these sightings occur largely by

SMP12- Whale Shark	
	chance, although they do indicate the presence of these animals around oil and gas facilities offshore and in deep water on the shelf. 5) Tagging data. Satellite telemetry has been used to describe the movement patterns of whale sharks along the Ningaloo coast and extending into the Timor Sea and south-east Indian Ocean. This data cannot be used to estimate patterns of abundance, but does provide important insights into the feeding, residency and migratory behaviours of sharks under 'normal' oceanographic conditions within the Exmouth sub-basin. Much of this data has been gathered by tag deployments led or assisted by AIMS. Researchers from other institutions have also deployed tags on whale sharks at Ningaloo at tracked movement, including a recent study by Ecocean/University of QLD (Reynolds et al., 2017). 6) Food chain studies. Surveys of euphausiids (a major food item of whale sharks at Ningaloo; Jarman and Wilson, 2004) and other mesoplankton in the region of Ningaloo Reef have been published by Wilson et al. (2001; 2003). Preliminary work on the food chains leading to the prey of whale sharks is underway (Marcus et al., 2016, 2019). This ongoing research may identify the physical and biological factors correlated with whale shark abundance at Ningaloo and thus result in a better understanding of variability in the ecosystem. Such information is essential if the effects of an oil spill or development are to be discerned against a background of natural changes in distribution and abundance of whale sharks.
Initiation criteria	Operational monitoring indicates that Ningaloo Coast whale shark aggregations are contacted or predicted to be contacted by oil. Contact is defined as hydrocarbon exceeding one of the following thresholds: • 1 g/m^2 Floating oil • 10 ppb Dissolved Aromatic Hydrocarbons • 10 ppb Entrained hydrocarbons.
Termination criteria	The termination criteria for this monitoring program are: • 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.
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 works	Prepared within 24 hours of this SMP being activated
Implementation	Service provider able to mobilise within 72 hours of the scope of work having been approved
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

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 from relevant EP, Santos GIS mapping and online resources (DoT oil spill response atlas, DoE conservation values atlas) • 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) and 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.

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 or, 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. Santo WA has also recently undertaken a Tier 2 audit of Astron (December 2018) 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 (OSMP) project, governed through an APPEA-Industry Steering Committee. This project, being progressed throughout 2020, 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 currently 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 March 2019 by Astron (Baseline Data Review document QE-00-BI-20001) and looked at all high biodiversity value receptors in the Santos EMBA. Following this an additional assessment was undertaken in September 2019 (DC-40-RI-20017) to determine whether existing baseline data is sufficient and accessible for sensitive receptors that could be impacted from worst case Commonwealth waters spills scenarios associated with operational activities at or around Devil Creek pipeline/Reindeer platform, Varanus Island and Ningaloo Vision facilities. This study concentrated on sensitive receptor areas with minimum hydrocarbon contact times of less than seven days as indicated by stochastic spill modelling; it is considered that contact within seven days would require an enhanced understanding of available baseline data to ensure a timely response.

The assessment of baseline data included:

1. A review of the following parameters for each program identified:
   - IMCRA
   - Custodian- contact point for data
   - Spatial extent

- Variables available for monitoring
- Methods applied to monitoring
- Year of most recent data capture
- Total duration of monitoring program
- Data completeness (number of years monitored as proportion of program duration)
- How often data is captured
- Appropriateness of variables (Judgement as to whether variables are appropriate for future oil spill monitoring)
- Is there any clear indication that the monitoring will continue?

2. The quality of the following parameters were then ranked as high, medium, low or unknown:
   I. Year of most recent capture:
      - 2015-2018 (if a single data capture has occurred in the last two years, then the overall program can be considered of high quality) = high
      - 2009-2014 = medium
      - <2009 = low
   II. Duration:
      - >4 years = high
      - 2-4 years = medium
      - 1 year = low
   III. Data completeness:
      - 100% = high
      - 75-99% = medium
      - <75% = low
   IV. Frequency of capture
      - Annually = high
      - Bi-annually = medium
      - <Bi-annually = low
   V. Appropriateness of parameters
      - High/medium/low

      Appropriateness of parameters was based on reference to the Scientific Monitoring Plan's targeted states for each receptor and considering whether the monitoring parameters were sufficient to compare against these states. Parameters were considered highly appropriate if all targeted states for a receptor could be quantified, of medium appropriateness if only some states could be quantified and low if the monitored parameters had little relevance to the targeted states of an individual receptor.

3. An overall assessment of each study program was then made as follows:
   - All parameters rated high = overall 'good'
   - At least one parameter rated medium = overall 'fair'
   - At least one parameter rated low = overall 'poor'
   - Unknown = overall not enough data to rate

The above assessment process was also performed across monitoring programs which specified at least one of the protection priority areas within their monitoring sites. For protection priority areas, the above assessment was then used to determine if 1) the baseline data available could be used to detect change in the state in the event of a significant impact - Classified as "good" in the above assessment (ie., data was current, of reasonable duration and frequency, and employed appropriate methodologies) or 2) the existing baseline data is unlikely to be suitable to detect change in state – classified as "fair" or "poor" by the above assessment (ie., the data was dated, infrequent, of limited duration and/or relied on inappropriate methodologies).

The results of the Baseline Data Review document (QE-00-BI-20001) and subsequent baseline and capability assessment of protection priority areas detailed in DC-40-RI-20017 has been provided within the Environment Functional Team Folder on the Emergency Response Intranet page so that this information is accessible to guide Santos IMT Environmental roles and monitoring provider roles in the event of activating oil spill scientific monitoring.

The subsequent information provides details on the capability of the Monitoring Service Provider based on the latest monthly capability report submitted to Santos.

SMP	No. personnel per team	No. teams	Survey type	Required Competencies	Desirable Competencies
SMP 1 - Water quality	2	3	Undefined	One member in each team to have experience in water sampling	
SMP 2 - Sediment quality				One member in each team to have experience in deep sea sediment sampling	
SMP 3 - Sandy beaches/rocky shore	2	2	Undefined	One team member in each team to have experience in shoreline macrofauna/infauna assessment	
SMP5 - Intertidal mudflats					
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 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 member with experience in turtle survey techniques	
SMP 10 - Seafood quality	3	2	Undefined	One member in each team to have experience in fish identification and necropsy	
SMP 11 - Fish, fisheries and aquaculture			Undefined	One member in each team to have BRUV experience	

Competencies	Abbreviation	Criteria	Ranking
Office Support	OS	No direct experience but able to provide office support	0
Non-independent Field Team Member	FS	No direct experience or <1 years experience, but relevant transferable experience and able to work with experienced team member	1
Independent Team Member	TM	Moderate level of experience 1-2 years, independent team member	2
Field Team Leader	FTL	High level of experience, >2 years, team leader capability	3
Technical Advisor	TA	Office-based, >5 years experience in identified field	4

Role	Qualification	Experience
Principal Scientist	Must have: Graduate Degree or Higher in Natural Resource Management, Biological and/or Environmental Science, Botany, Zoology or relevant natural sciences	• 12 years plus experience in Natural Resource Management / Botanical / Biological / Environmental Science / Fauna studies, investigations, monitoring and/or research • Prior experience in the management and/or directing of projects, personnel and teams.
Senior Scientist	Must have: Graduate Degree or Higher in Natural Resource Management, Biological and/or Environmental Science, Botany, Zoology or relevant natural sciences	• 6 years plus experience in Natural Resource Management / Botanical / Biological / Environmental Science / Fauna studies, investigations, monitoring and/or research • Prior experience in the management and/or directing of projects, personnel and teams.
Scientist	Must have: Graduate Degree or Higher in Natural Resource Management, Biological and/or Environmental Science, Botany or Zoological Sciences	2 years plus experience in Natural Resource Management / Botanical / Zoological / Biological / Environmental Science studies, investigations, monitoring and/or research.
Technician	Preferred: Teritiary qualification in Environmental and/or Natural Resource Management	Some exposure to botanical / biological / environmental science field programs

Surname	First name	Role	Monitoring Coordination Team	SMP 4 (Mangroves)	SMP 9 (Reptiles)	SMP4 (Shorebirds/ Seabirds)	SMP 8 (Megafauna)	Pathology /veterinary skills	Certified Marine Mammal Observer	Aerial survey experience	Vessel survey experience	Terrestrial fauna surveys	Terrestrial vegetation surveys	TBOSIET	[redacted]
Archibald	Robert	Technical Advisor/Principal Scientist	4	4	1	1	1	0	0	1	1	1	3		
Bleby	Tim	Senior Scientist	0	4	1	1	1	0	0	1	1	1	3		
Brown	Michael	Senior Scientist	0	1	1	2	1	2	0	1	1	3	1		
Burdon	Josh	Environmental Technician	0	1	1	1	1	0	0	1	1	1	1		
Collard	Joshua	Environmental Technician	0	1	1	1	1	0	0	1	1	1	1		[redacted]
Dadour	Lucy	Environmental Scientist	0	1	3	3	1	1	0	1	1	2	3		
de Vos	Roxanne	Environmental Technician	0	1	2	1	1	1	0	1	1	1	1		
Dorrington	Jean	Environmental Scientist	0	2	1	1	1	0	0	1	1	1	1		
Dundon	Daenia	Senior Environmental Technician	0	2	1	1	1	0	0	1	1	1	1		
Eckermann	Ben	Senior Scientist	0	1	1	1	1	0	0	1	1	1	3		
Espiritu	Mildred	Environmental Technician	0	1	1	1	1	0	0	1	1	0	1		
Ford	Melissa	Planning and Logistics Officer (Deputy)	5	0	1	1	1	0	0	1	1	1	1		
Funnekotter	Anna	Environmental Scientist	0	2	1	1	1	0	0	1	1	1	2		
Gove	Aaron	Senior Scientist	4	4	1	4	1	1	0	3	3	3	1		
Grosser	Kady	Environmental Scientist	0	1	1	2	1	1	0	1	1	2	2		
Jayasekara	Palitha	Environmental Scientist	0	1	1	1	1	0	0	1	1	1	3		[redacted]
Johnston	Jess	Techinical Advisor/Senior Scientist	4	3	4	4	2	2	0	3	3	3	1		
Jorgensen	Brett	Environmental Technician	0	0	1	1	1	0	0	1	1	1	1		
Keirle	David	Environmental Scientist	0	1	2	3	1	1	0	1	1	3	1		
Kruger	Julian	Monitoring Coordinator	4	0	1	1	1	0	0	1	1	1	1		
Long	Vicki	Associate Scientist	0	4	1	3	1	0	0	1	3	2	3		
Love	Matt	Senior Scientist	4	4	3	4	1	2	0	1	3	3	2		
Lucas	Brett	Assistant Manager	5	2	1	1	1	0	0	1	1	1	1		
McMaster	Kellie	Senior Scientist	0	1	1	1	1	1	0	1	1	1	3		
Mack	Andy	Environmental Technician	0	1	1	1	1	0	0	1	1	0	1		
Mart	Kyle	Environmental Scientist	0	2	1	1	1	0	0	1	1	1	2		
Melville	Bethany	Senior Scientist	0	2	1	1	1	0	0	1	1	1	3		
Mikli	Markus	Environmental Scientist	0	1	1	1	1	0	0	1	1	1	3		
Mitchell	Celia	Graduate Environmental Scientist	0	1	1	1	1	1	0	1	1	1	1		
Moore	Sharyn	Senior Scientist	0	1	1	1	1	0	0	1	1	1	3		
Mueller	Sam	Senior Scientist	0	0	1	1	1	0	0	1	1	1	1		
Murless	Rowan	Senior Environmental Technician	0	1	3	1	1	0	0	1	1	2	1		
Osborn	Brittany	Environmental Scientist	0	0	1	1	1	0	0	1	1	2	1		
Pearse	Stuart	Operations Officer	5	0	1	1	1	0	0	1	1	1	1		
Poole	Holly	Graduate Environmental Scientist	0	1	1	1	1	0	0	1	1	1	1		
Resta	Jack	Environmental Technician	0	1	1	1	1	0	0	1	1	1	1		
Ronan	Sam	Environmental Technician	0	0	0	1	0	0	0	1	1	1	1		[redacted]
Smithies	Sean	Environmental Technician	0	1	1	1	1	0	0	1	1	1	1		
Stalker	Megan	Planning and Logistics Officer	5	0	1	1	1	0	0	1	1	2	1		
Vaughan	Linda	Environmental Scientist	0	1	1	1	1	0	0	1	1	1	2		
Warrener	Haylea	Environmental Scientist	0	1	1	1	1	0	0	1	1	1	1		
Wishart	Will	Monitoring Coordinator (Deputy)	5	0	1	1	1	0	0	1	1	1	1		
***This is a subset**	**4**	**TA***	**5**	**5**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		
	3	**FTL**	**0**	**1**	**4**	**6**	**0**	**0**	**0**	**2**	**4**	**5**	**10**		
	2	**TM**	**0**	**6**	**2**	**2**	**1**	**3**	**0**	**0**	**0**	**6**	**5**		
	1	**FS**	**0**	**21**	**35**	**34**	**40**	**7**	**0**	**40**	**38**	**29**	**27**		
	5	**Monitoring Coordination Team - Office Support**	**5**	**0**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		

External Suppliers														
		Kingfisher Environmental Consulting (subcontractor)	0		1	3	1	1	1	1	1	4	1
		Independent	5		1	1	1	1	1	1	1	1	1
		Kimberley Birdwatching (subcontractor)	0		1	3	1	1	1	4	3	3	1
		Casual	0		1	3	1	1	1	1	1	1	1
		Casual	0		1	3	1	1	1	1	1	4	1
		Casual	0		1	3	1	1	1	1	1	4	1
		Casual	0		4	3	2	1	1	1	3	3	1
		Independent	0		1	1	3	1	1	2	2	1	1
		Imbricata Environmental (subcontractor)	4		4	2	4	1	4	4	4	4	1
		Halfmoon Biosciences (subcontractor)	0		1	4	1	2	1	2	4	4	1
Sanders	Kate	University of Adelaide (subcontractor)	4		1	1	1	4	1	1	4	1	1
Guinea	Michael	Charles Darwin University (subcontractor)	4		4	1	1	4	1	4	4	4	1
		Aquatica Environmental (subcontractor)	4		4	2	3	1	1	2	4	4	1
		Independent	0		1	1	2	1	1	1	1	2	1
		NRGseascapes (subcontractor)	4		3	1	3	1	1	1	3	3	1
Steptoe	Verity	Independent	4		1	1	4	1	4	4	4	4	1
***This is a subset**	**4**	**TA***	**6**		**4**	**1**	**2**	**2**	**2**	**4**	**6**	**8**	**0**
	3	**FTL**	**0**		**5**	**7**	**5**	**2**	**2**	**4**	**9**	**11**	**0**
	2	**TM**	**0**		**0**	**2**	**2**	**1**	**0**	**3**	**1**	**1**	**0**
	1	**FS**	**0**		**11**	**7**	**9**	**13**	**14**	**9**	**6**	**4**	**16**
	5	**Monitoring Coordination Team - Office Support**	**1**		-	-	-	-	-	-	-	-	-
TOTAL (INTERNAL AND EXTERNAL CAPACITY)													
of the FTL	**4**	**TA***	**11**	**5**	**5**	**4**	**2**	**2**	**2**	**4**	**6**	**8**	**0**
	3	**FTL**	**0**	**1**	**9**	**13**	**5**	**2**	**2**	**6**	**13**	**16**	**10**
	2	**TM**	**0**	**6**	**2**	**4**	**3**	**4**	**0**	**3**	**1**	**7**	**5**
	1	**FS**	**0**	**21**	**46**	**41**	**49**	**20**	**14**	**49**	**44**	**33**	**43**
	5	**Monitoring Coordination Team - Office Support**	**6**	-	-	-	-	-	-	-	-	-	-

[redacted]

***This is a subset of the FTL numbers, not additional to.**

Note: Names hidden for privacy and confidentiality purposes

Surname	First name	Title	Role	Competency to support SMPs									Relevant skills													
				SMP 1 - Water quality	SMP 2 - Sediment quality	SMP 3 - Sandy beaches/rocky shore	SMP 5 - Intertidal mudflats	SMP 6 - Benthic habitats	SMP 8 - Marine mammals	SMP 9 - Marine reptiles	SMP 10 - Seafood quality	SMP 11 - Fish, fisheries and aquaculture	Water sampling experience	Vessel based sediment sampling experience	Shoreline assessment experience	Benthic habitat assessment experience	ROV operator experience	Diving experience (ADAS)	Diving experience (Scientific)	Marine fauna observer experience	Turtle survey experience	Fish identification and necropsy	BRUV experience	Vessel survey experience	Aerial survey experience	Spatial services experience
BMT staff in WA																										
		Principal Marine Environmental Scientist	Principal Scientist	4	4	4	4	4	1	1	1	1	Competent	Competent	Competent	Competent								Compenent		
		Principal Marine Environmental Scientist	Principal Scientist	4	4	4	4	4	3	1	1	1	Competent	Competent	Competent	Competent		Competent		Competent				Compenent	Compenent	
		Principal Marine Environmental Scientist	Principal Scientist	4	4	3	3	4	1	1	1	1	Competent	Competent	Competent	Competent								Compenent		
		Principal Marine Environmental Scientist	Principal Scientist	4	4	3	3	4	1	1	1	1	Competent	Competent	Competent	Competent		Competent						Compenent		
		Principal Marine Environmental Scientist	Principal Scientist	4	4	4	4	4	1	1	4	4	Competent	Competent	Competent	Competent								Compenent		
		Principal Marine Environmental Scientist	Principal Scientist	2	2	4	4	2	1	3	1	1	Competent	Competent	Competent	Competent					Competent			Compenent		
		Principal Marine Environmental Scientist	Principal Scientist	2	2	4	4	2	1	1	1	1	Competent	Competent	Competent	Competent								Compenent		
		Associate Principal Marine Environmental Scientist	Principal Scientist	4	4	4	4	4	1	1	1	1	Competent	Competent	Competent	Competent		Competent						Compenent		
		Associate Principal Marine Environmental Scientist	Senior Scientist	3	3	3	3	3	1	1	4	4	Competent	Competent	Competent	Competent		Competent				Competent		Compenent		
		Associate Principal Marine Environmental Scientist	Senior Scientist	4	4	3	3	3	1	1	1	1	Competent	Competent	Competent	Competent		Competent						Compenent		
		Associate Principal Marine Environmental Scientist	Senior Scientist	4	4	3	3	3	1	1	1	1	Competent	Competent	Competent	Competent								Compenent		
		Senior Marine Environmental Scientist	Senior Scientist	3	3	3	3	3	3	1	1	1	Competent	Competent	Competent	Competent	Competent			Competent				Compenent	Compenent	
		Senior Marine Environmental Scientist	Senior Scientist	2	2	2	2	2	1	1	1	1	Competent	Competent	Competent	Competent								Compenent		
		Senior Marine Environmental Scientist	Senior Scientist	2	3	3	3	2	1	1	1	1	Competent	Competent	Competent	Competent								Compenent		
		Senior Marine Environmental Scientist	Senior Scientist	2	2	3	3	2	1	2	2	2	Competent	Competent	Competent	Competent	Competent	Competent			Competent	Competent	Competent	Compenent		
		Marine Environmental Scientist	Scientist	3	3	2	2	2	3	2	1	1	Competent	Competent	Competent	Competent				Competent	Competent			Compenent		
		Marine Environmental Scientist	Scientist	1	1	1	1	1	3	1	1	1	Competent	Competent	Competent	Competent				Competent				Compenent		
		Marine Environmental Scientist	Scientist	3	3	2	2	2	2	2	1	1	Competent	Competent	Competent	Competent							Competent	Competent		
		Graduate Marine Environmental Scientist	Scientist	1	1	1	1	1	2	1	1	1	Competent	Competent	Competent	Competent				Competent	Competent			Compenent		
		Graduate Marine Environmental Scientist	Scientist	1	1	1	1	1	2	2	1	1	Competent	Competent	Competent	Competent				Competent	Competent	Competent	Competent	Compenent		
		Graduate Marine Environmental Scientist	Scientist	1	1	1	1	1	1	2	1	1	Competent	Competent	Competent	Competent					Competent	Competent	Competent	Compenent		
		Graduate Marine Environmental Scientist	Scientist	1	1	1	1	1	2	2	1	1	Competent	Competent	Competent	Competent				Competent	Competent			Compenent		
		Spatial Services	Office Support	0	0	0	0	0	0	0	0	0														Compenent
		Spatial Services | Graduate Marine Environmental Scientist	Office Support	0	0	0	0	0	0	0	0	0														Compenent
		Spatial Services | Remote Sensing Analyst	Office Support	0	0	0	0	0	0	0	0	0														Compenent
		Spatial Services | Remote Sensing Analyst	Office Support	0	0	0	0	0	0	0	0	0														Compenent
Subcontractor support in WA (Curtin University Fish Ecology Group)																										
		Marine Science Professor	Principal Scientist	1	1	1	1	1	1	1	4	4							Compenent			Compenent	Compenent	Compenent		
		Marine Science Lecturer	Principal Scientist	1	1	1	1	1	1	1	4	4							Compenent			Compenent	Compenent	Compenent		
		Research Officer	Senior Scientist	1	1	1	1	1	1	1	3	3							Compenent			Compenent	Compenent	Compenent		
		Research Officer	Senior Scientist	1	1	1	1	1	1	1	3	3							Compenent			Compenent	Compenent	Compenent		
		Research Assistant	Scientist	1	1	1	1	1	1	1	3	3							Compenent			Compenent	Compenent	Compenent		
Total internal capacity																										
		4*	TA*	8	8	6	6	6	0	0	2	2														
		3	FTL	4	5	8	8	4	4	1	0	0														
		2	TM	5	4	3	3	7	4	6	1	1														
		1	FS	5	5	5	5	5	14	15	19	19														
		0	OS	4	4	4	4	4	4	4	4	4														
Total external capacity																										
		4*	TA*	0	0	0	0	0	0	0	2	2														
		3	FTL	0	0	0	0	0	0	0	3	3														
		2	TM	0	0	0	0	0	0	0	0	0														
		1	FS	5	5	5	5	5	5	5	0	0														
		0	OS	0	0	0	0	0	0	0	0	0														
Total internal and external capacity																										
		4*	TA*	8	8	6	6	6	0	0	4	4														
		3	FTL	4	5	8	8	4	4	1	3	3														
		2	TM	5	4	3	3	7	4	6	1	1														
		1	FS	10	10	10	10	10	19	20	19	19														
		0	OS	4	4	4	4	4	4	4	4	4														

Notes:
*This is a subset of the FTL numbers, not additional to
Refer to 'skill ranking criteria' tab for explanation of rankings and competencies

Note: Names hidden for privacy and confidentiality purposes

Appendix Q: Forward Operations Guidance

Forward Operating Base (FOB)

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

Depending upon the location and scale of the incident, Santos Dampier facilities leased from Toll Energy may be used. 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 a FOB for State based response.

Depending upon the location and scale of the incident for a VBA operation spill response Santos could also establish a FOB at Harold E Holt (HEH) Military Base through the HEH Facilities Manager or Exmouth SES Incident Command Centre for a local FOB through the Exmouth Shire CEO.

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

Additional FOBs may be set up as operational requirements dictate. Potential locations for FOBs, additional to Exmouth, based on shoreline areas potentially impacted include Port Hedland.

Local facilities with operational value for response uses for Exmouth and Port Hedland are listed **Table 1** and **Table 2** respectively.

Table 1: Exmouth facilities with operational value for response

Facility	Owner/Operator	Potential Uses
Harold E. Holt Naval Base	Australian Government Department of Defense	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 Defense	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 2: Port Hedland facilities with operational value 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 Marine equipment storage, staging and repairs Oiled wildlife response centre Laydown/storage area Bunded washing facilit
Go Marine Group Offices	Go Marine	FOB OCC Offices

Forward Staging Areas

Staging areas for shoreline operations will be set up at shoreline response locations under the direction of the DoT as the Control Agency for shoreline response activities. Wildlife treatment facilities may also be set-up under the direction of DoT and DBCA to clean and rehabilitate oiled wildlife.

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.

Mobile plant

Mobile plant and equipment for mechanical clean-up can be provided from suppliers in Exmouth, Port Hedland or Perth as required.

Decontamination

Decontamination areas (HDPE lining provided through the provider of PPE) will be constructed for maintaining the integrity of the 'Zones' at shoreline Staging Areas, location and terrain permitting and as directed by the DoT as Control Agency for the shoreline response. Contaminated water from the decontamination areas will be regularly pumped out. All contaminated waste water will be decanted into suitable transportable medium provided by Santos' WSP for removal.

Ablutions

Staging Areas may be supported by toilet/ablution solutions; these solutions will be dictated by the location and terrain of the clean-up operations. Available facilities include:

+ Portable Toilets;
+ Trailer Mounted Toilets; and
+ Transportable Toilets.

These solutions are chemical and fresh water based, and supported by weekly/fortnightly flushing servicing. The requirement of the situation will dictate if this service is supplied out of Karratha or Perth. Santos' WSP can provide disposal as required of wastewater from ablutions.

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 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.

Messing

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

Freight movement

The transportation of all equipment and service from all stockpiles and centres can be facilitated through Santos' third party logistics providers.

Cleaning and repair

Cleaning and repair of booms and other operational equipment this can be carried out in bunded areas at the forward staging area or supply base facilities.

Suppliers

All material, associated equipment and services will be sourced, where possible, through existing Santos suppliers. Service Orders will be raised if other/new suppliers are to be engaged to provide services etc. in the event of an oil spill.

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 Port Hedland, Dampier and Karratha. Santos' Devil Creek accommodation close to Karratha may also be used.

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

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 our 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.

Providoring

Providoring arrangements, when utilising local facilities would be covered under Service Orders/Purchase Order Terms and Conditions, however if required Santos has existing contracts with local who could be used for additional providoring support. These supplies would be transported to the respective spill response staging area by one of Santos' third party logistics providers.

The providoring requirements for transportable and remote messing would be provided directly through contracted service providers, including the transportation thereof.

PPE

Santos would utilise the services of specialist providers of PPE for clean-up operations. All PPE would be sourced in Perth and transported by one of QE's 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 utilise the services of a specialist communication provider to hire hand-held 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 licenced for locations in Exmouth and along the Ningaloo coast and permit land, sea and air radio communications.