# Pyrenees Phase 4 Infill Drilling Program Oil Pollution Emergency Plan

**Document No: BHPB-04PY-N950-0022**

| REVISION RECORD | | | | | | |
|---|---|---|---|---|---|---|
| **Rev** | **Date** | **Description** | **Prepared by** | **Reviewed by** | **Reviewed by** | **Approved by** |
| 0 | 13/12/2021 | Issued for NOPSEMA assessment | Environment Principal Projects | Principal Environment & Regulatory | Head of Drilling & Completions - Australia | Asset Manager |
| | | | | | | |

| Revision History | | |
|---|---|---|
| **Revision Label** | **Revision Date** | **Comments** |
| A | 08/11/2021 | Draft Issued for Review |
| B | 09/12/2021 | Internal comments incorporated |
| 0 | 13/12/2021 | Issued for NOPSEMA assessment |
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# Department of Transport Response & Consultation Summary

This Response and Consultation Summary outlines the relevant information requested from the Western Australian Department of Transport (WA DoT), as the Hazard Management Agency (HMA) for Marine Oil Pollution (MOP) in State waters, as per Appendix 6 of the *Offshore Petroleum Industry Guidance Note Marine Oil Pollution* (DoT, 2020):

| Environment Plan (EP) Summary Material Requirement | Relevant Section of OPEP / EP |
|---|---|
| Description of activity, including the intended schedule, location (including coordinates), distance to nearest landfall and map. | Section 1.1 of OPEP |
| Worst case spill volumes. | Section 1.6 of OPEP |
| Known or indicative oil type/properties. | Section 1.6 of OPEP |
| Amenability of oil to dispersants and window of opportunity for dispersant efficacy. | Appendix B – OPEP: Basis of Design and Field Capability Analysis |
| Description of existing environment and protection priorities | Section 5 of OPEP (further detail in Section 4 of EP) |
| Details of the environmental risk assessment related to marine oil pollution - describe the process and key outcomes around risk identification, risk analysis, risk evaluation and risk treatment. For further information see the Oil Pollution Risk Management Information Paper (NOPSEMA, 2017). | Section 8 of Appendix B – OPEP: Basis of Design and Field Capability Analysis |
| Outcomes of oil spill trajectory modelling, including predicted times to enter State waters and contact shorelines. | Section 5.1.1 and Section 5.1.2 of OPEP |
| Details on initial response actions and key activation and mobilisation timeframes. | Section 6 of OPEP |
| Potential Petroleum Titleholder Incident Control Centre requirements, facilities and locations. | Section 3.3 of OPEP |
| Potential Petroleum Titleholder Staging Areas / Forward Operating Base requirements, facilities and locations. | Section 6.13 of OPEP |
| Details on response strategies. | Section 7.2 of Appendix B – OPEP: Basis of Design and Field Capability Analysis |
| Details and diagrams on proposed Petroleum Titleholder and DoT IMT structures and interactions including integration of DoT arrangements as per this Guidance Note. | Section 2.1 of OPEP; and Appendix A – APU IMT Capability Analysis |
| Details on exercise and testing arrangements of OPEP. | Section 10.6.8 of EP |

# Contents

# List of Tables

# List of Figures

### Acronyms and Glossary

| Term | Description |
|---|---|
| µ | Micron |
| AHTS | Anchor handling tug supply (vessel) |
| ALARP | As low as reasonably practicable |
| AMOSC | Australian Maritime Oil Spill Centre |
| AMSA | Australian Maritime Safety Associations |
| APPEA | Australian Petroleum Production and Exploration Association |
| APU | Australian Production Unit |
| AUV | Autonomous underwater vehicle |
| bbl/day | Barrels per day |
| BACI | Before-After-Control-Impact |
| BHP | BHP Petroleum Pty Ltd |
| BIA | Biologically important area |
| BOD | Basis of Design |
| BOP | Blowout preventer |
| CA | Controlling Agency |
| CEM | Crisis and emergency management |
| CHARM | Chemical hazard and risk management |
| Cwlth | Commonwealth |
| CWTS | Controlled waste tracking system |
| DAWE | Department of Agriculture, Water and the Environment |
| DBCA | Department of Biodiversity, Attractions and Conservation |
| DFES | Department of Fire and Emergency Services |
| DIIS | Department of Industry Innovation and Science |
| DMIRS | Department of Mines, Industry Regulation and Safety (formerly the Department of Mines and Petroleum [DMP]) |
| DNP | Director of National Parks |
| DoEE | Department of Environment and Energy |
| DoT | WA Department of Transport |
| DP | Dynamic positioning |
| DNP | Director of National Parks |
| DPIRD | WA Department of Primary Industries and Regional Development |
| DSS | Dispersant spraying system |
| ECC | Emergency and Crisis Centre |
| EMBA | Environment that may be affected |
| EMT | Emergency Management Team |
| EP | Environment Plan, prepared in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 |
| EPO | Environmental Performance Outcome |
| EPS | Environmental Performance Standard |
| ERP | Emergency Response Plan |
| FPSO | Floating storage and offloading (facility) |
| FRT | Field Response Team |
| FWADC | Fixed wing aerial dispersant capability |
| HMA | Hazard Management Agency |
| IAP | Incident Action Plan |
| IAPP | International air pollution prevention |
| IBC | International bulk carriers |
| IC | Incident Commander |
| ICS | Incident Command Structure |
| IGN | Industry Guidance Note |
| IMO | International Maritime Organisation |
| IMP | Incident Management Plan |
| IMR | Integrity Management & Response |
| IMS | Introduced marine species |
| IMT | Incident Management Team |
| IOGP | International Oil and Gas Producers |
| IOPP | International oil pollution prevention |
| ISPP | International sewage prevention pollution |
| ITOPF | International Tank Owners Federation |
| JRCC | AMSA's Joint Rescue Coordination Centre |
| JSCC | Joint Strategic Coordination Committee |
| KEF | Key ecological feature |
| km | Kilometre |
| L | Litre |
| LOWC | Loss of Well Control |
| m | Metre |
| mm | Millimetre |
| $m^3$ | Cubic metre |
| m/s | Metres per second |
| MC | Measurement Criteria |
| MEE | Maritime environment emergency |

| | |
|---|---|
| MARPOL | The Convention for the Prevention of Pollution from Ships (MARPOL Convention) |
| MDO | Marine diesel oil |
| MNES | Matters of National Environmental Significance, according to the EPBC Act |
| MODU | Mobile Offshore Drilling Unit |
| MOP | Marine oil pollution |
| MoU | Memorandum of Understanding |
| nm | Nautical mile |
| NAT-DET | National Plan dispersant effectiveness field test kit |
| NEBA | Net Environmental Benefit Analysis |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority |
| NOPTA | National Petroleum Titles Administrator |
| NWMR | North West Marine Region |
| OCNS | Offshore Chemical Notification Scheme |
| OIM | Offshore Installation Manager |
| OIW | Oil-in-water |
| OPGGS Act | Offshore Petroleum and Greenhouse Gas Storage Act 2006 |
| OPEP | Oil Pollution Emergency Plan |
| OSCP | Oil Spill Contingency Plan |
| OSMBIP | Operational and Scientific Bridging Implementation Plan |
| OSMP | Operational and Scientific Monitoring Plan |
| OSRA | Oil Spill Response Agency |
| OSRC | Oil spill response coordination |
| OSRL | Oil Spill Response Limited |
| OSTB | Oil spill tracking buoys |
| OSTM | Oil spill trajectory modelling |
| ppb | Parts per billion |
| ppm | Parts per million |
| ppt | Parts per thousand |
| PIC | Person in charge |
| PMS | Preventative maintenance system |
| POSOW | Preparedness for Oil Pollution Shoreline Clean-up & Oiled Wildlife Interventions |
| PPE | Personal protective equipment |
| PROWRP | Pilbara Region Oiled Wildlife Response Plan |
| QET | Quick-effectiveness test |
| ROV | Remotely operated vehicle |
| RS | Response Strategy |
| SAR | Search and rescue |
| SCAT | Shoreline clean-up assessment technique |

| | |
|---|---|
| SCERP | Source Control Emergency Response Plan |
| SCS | Source Control Section (BHP IMT) |
| SCSC | Source Control Section Chief |
| SCSSV | Surface controlled subsurface safety valve |
| SEMC | State Emergency Management Committee |
| SHP-MEE | State Hazard Plan – Maritime Environmental Emergencies |
| SFRT | Subsea first response toolkit |
| SINTEF | The Foundation for Scientific Research at the Norwegian Institute of Technology |
| SIMA | Spill Impact Mitigation Assessment |
| SIRT | Subsea Incident Response Toolkit |
| SMPEP | Shipboard Marine Pollution Emergency Plan |
| SOPEP | Shipboard Oil Pollution Emergency Plan |
| SSDI | Subsea dispersant injection |
| SSTT | Subsea Test Tree |
| TPH | Total petroleum hydrocarbons |
| TRP | Tactical Response Plan |
| VOC | Volatile organic compound |
| WA | Western Australia |
| WAOWRP | WA Oiled Wildlife Response Plan |
| WCD | Worst Case Discharge |
| WMP | Waste Management Plan |
| WOMP | Well Operations Management Plan |
| WWC | Wild Well Control |

# 1 Introduction

## 1.1 Overview and Timing of the Proposed Activity

BHP Petroleum (Australia) Pty Ltd (BHP) proposes to undertake infill development drilling activities at the Crosby South Well Centre (Crosby-3H1 and Crosby-4H2 well locations) and at the Stickle Well Centre (Stickle-4H1 well location) within production licence area WA-42-L in Commonwealth waters. The closest landfall is the North West Cape peninsula, Exmouth, approximately 27 km to the south-east. The proposed activities are located approximately 13 km outside the northern boundary of the Ningaloo Marine Park. The water depth in the operational area is approximately 200 m.

The proposed petroleum activity represents Phase 4 of the ongoing development of the Pyrenees field development program and includes well intervention for purposes of water shut-off at Crosby-3H1 location, two horizontal side-track laterals at the Stickle-4H1 well location and potentially a contingent side-track lateral at the Crosby-4H2 well location. The operational area for the petroleum activity is a 2 km radius around each of the two well centres. The operational area sets the spatial boundary within which the activity will occur. The proposed activity is to be undertaken using a semi-submersible mobile offshore drilling unit (MODU).

The earliest expected commencement date for infill drilling activities is Q2 2022, although for contingency purposes due to MODU availability and weather constraints, the EP allows for the petroleum activity to occur any time between over calendar years 2022 and 2023.

The activity will be undertaken 24 hours a day, 7 days a week.

The Stickle-4H1 dual lateral re-entry has the potential for the largest volume of released hydrocarbons.

Crosby-4H2 single lateral well has the potential to flow, but at a reduced rate and volume compared with Stickle-4H1.

Crosby-3H1 is a dual-lateral well which requires artificial gas lift operation in order to produce from the well.

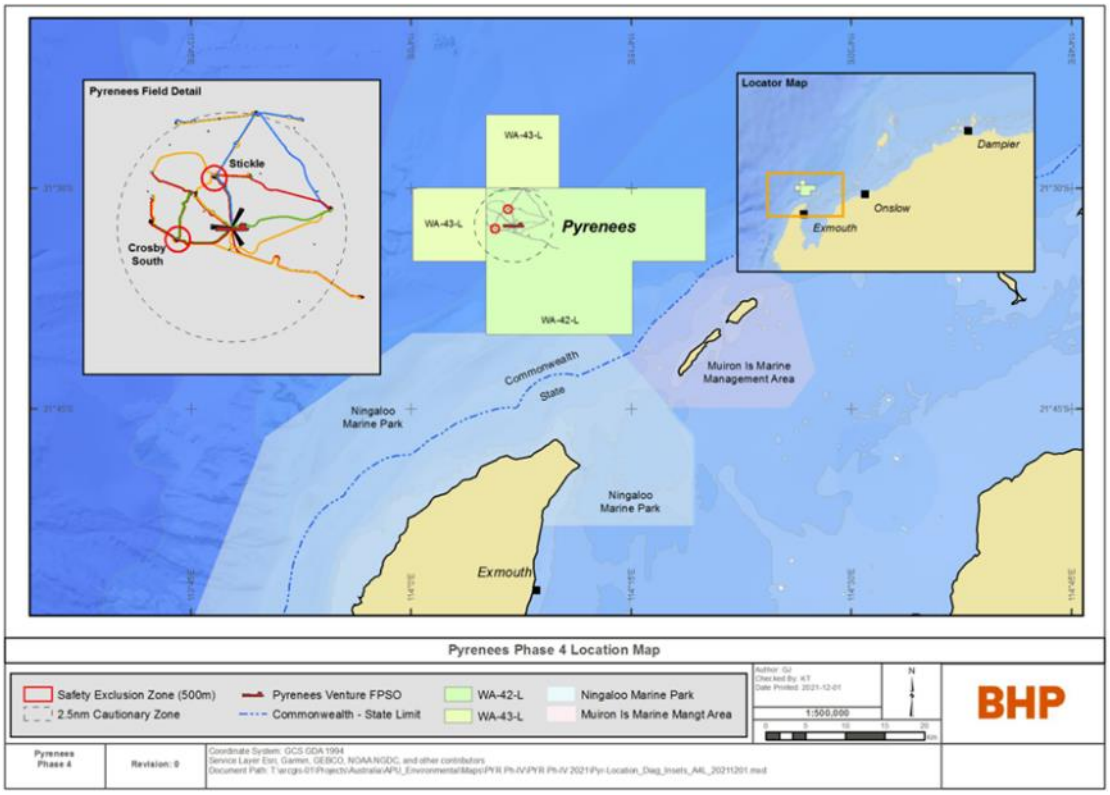



Figure 1-1: The Pyrenees facility & Pyrenees Phase 4 well locations

## 1.2 Purpose of Oil Pollution Emergency Plan

This Oil Pollution Emergency Plan (OPEP) has been developed to establish the processes and procedures within BHP to respond to and effectively manage oil pollution emergencies that may occur during the Pyrenees Phase 4 Infill Drilling Program activities in petroleum production licence WA-42-L, offshore Western Australia.

This OPEP details the spill response capability to implement each spill Response Strategy (RS) in a timely manner both in State and Commonwealth jurisdictions.

This OPEP is an appendix to the *BHP Pyrenees Phase 4 Infill Drilling Program Environment Plan* (BHPB-04PY-N950-0021) and is required under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations (the OPGGS (Environment) Regulations) for approval to undertake petroleum activities in Commonwealth waters.

The Pyrenees Development was assessed and accepted under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) in March 2005 (referral number 2005/2034). The Ministerial Conditions Annexure 1 – Condition 2 states that: The person taking the action must submit for the Minister's approval an oil spill contingency plan to mitigate the environmental effects of any hydrocarbon spills. relevant authorities, persons and organisations.

## 1.3 Scope of Oil Pollution Emergency Plan

This OPEP applies to the BHP Pyrenees Phase 4 Infill Drilling Program accepted or operating under an instrument of the OPGGS Act and the Ministerial Conditions and potential oil pollution emergencies resulting from these activities.

This OPEP applies to all field-based response strategies (RS) with the exception of Source Control which is covered separately within the *BHP Australia Source Control Emergency Response Plan* (SCERP) (OSRL-SW-PLA-00025). However, consistent with NOPSEMA Information Paper A787102: Source Control Planning and Procedures (June 2021), relevant information demonstrating preparedness and timeliness of Source Control measures are summarised within this OPEP and Appendix B – OPEP: Basis of Design and Field Capability Analysis.

This plan considers the Western Australia Department of Transport (WA DoT) State Hazard Plan – Maritime Environmental Emergencies (SHP-MEE) and Industry Guidance Note (IGN) on Marine Oil Pollution (MOP): Response and Consultation Arrangements (July, 2020).

BHP acknowledge that as per the IGN, WA DoT will be the Controlling Agency (CA) in State waters and lands. BHP will provide all necessary resources including personnel and equipment to resource WA DoT's Incident Management Team (IMT) and response, as agreed during consultations with WA DoT.

This plan is to be reviewed and implemented in conjunction with the *BHP Pyrenees Phase 4 Infill Drilling Program Environment Plan* (BHPB-04PY-N950-0021).

## 1.4 Emergency Response Document Framework

The inter-relationship between this document and other BHP oil spill response documentation is presented in Figure 1-2 and Table 1-1.

This OPEP supports arrangements under the National Plan for Maritime Environmental Emergencies (NatPlan), AMOSPlan, WA State Hazard Plan – Maritime Environmental Emergencies (SHP-MEE), WA DoT Oil Spill Contingency Plan (WA DoT OSCP), and Western Australian Oiled Wildlife Response Plan (WAOWRP).

This OPEP is supported by a series of detailed field response guidance documents (RS2-RS13) and site-specific Tactical Response Plans (TRPs) for the implementation of applicable response strategies as identified via the strategic Spill Impact Mitigation Assessment (SIMA) process.

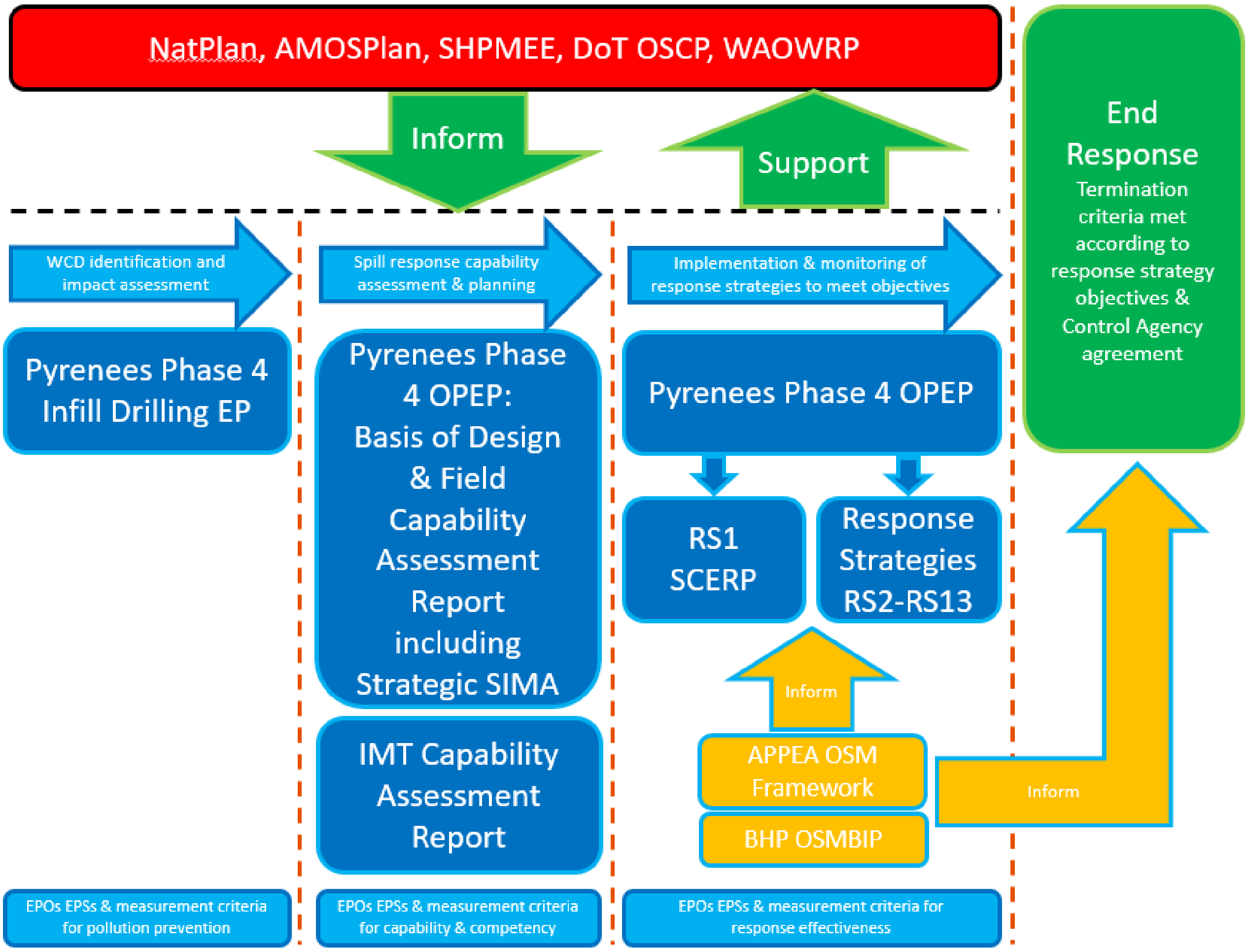



**Figure 1-2: BHP spill response document framework**

**Table 1-1: BHP spill response document framework**

| Document Title | Document Number | Purpose |
|---|---|---|
| APU Incident Management Plan (IMP) | AOHSE-ER-0001 | The Incident Management Plan (IMP) describes the process for responding to any credible incident or emergency within the boundaries of Australia in order to ensure the Safety of Personnel, the Environment and BHP Petroleum Assets and Reputation (SPEAR). |
| BHP Pyrenees Phase 4 Infill Drilling Program Environment Plan (EP) | BHPB-04PY-N950-0021 | The EP contains the following:<br>• detailed activity description;<br>• detailed description of the environment that may be affected (EMBA) by a credible worst-case discharge (WCD) scenario;<br>• description and risk assessment of oil spills on environmental values and sensitivities; and<br>• evaluation of controls to prevent oil pollution from the described activity and associated EPOs / EPSs and measurement criteria |
| BHP Pyrenees Phase 4 Infill Drilling Program Oil Pollution Emergency Plan - Basis of Design and Field Capability Assessment (Appendix B) | BHPB-04PY-N950-0002 | The BOD presents an overview of the petroleum activity and associated oil spill risks. It includes an evaluation of modelling outcomes from the identified WCD scenarios.<br>It includes a strategic SIMA for the identified WCD scenarios associated with the Pyrenees Phase 4 Infill Drilling Program.<br>It also provides a detailed evaluation of response needs based upon WCD scenarios and presents an oil spill response field capability analysis, inclusive of Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurements Criteria for response preparedness. |
| APU Incident Management Team (IMT) Capability Assessment (Appendix A) | AOHSE-ER-0071 | The IMT Capability Assessment evaluates the size and structure of the BHP IMT (inclusive of Source Control Section (SCS)) necessary to mobilise and maintain the field capability for a protracted worst-case oil pollution emergency i.e., a loss of well control (LOWC) scenario.<br>It provides a detailed evaluation of IMT capability and competency to enable the implementation of response strategies for the full duration of the oil pollution emergency inclusive of Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurements Criteria for maintenance of IMT capability & competency. |
| BHP Pyrenees Phase 4 Infill Drilling Program Oil Pollution Emergency Plan (OPEP) (this document) | BHPB-04PY-N950-0022 | The OPEP (this document) is the tool which would be utilised by the BHP IMT during any impending/actual oil spill event to implement the detailed Response Strategies (RS2 – RS13). |

| Document Title | Document Number | Purpose |
|---|---|---|
| | | The OPEP provides a detailed framework for spill response implementation inclusive of Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurements Criteria for the effectiveness of response strategy implementation. |
| BHP Australia Source Control Emergency Response Plan (SCERP) | OSRL-SW-PLA-00025 | The SCERP is consistent with the requirements of the BHP Critical Control Performance Standards: Source Control (PET-GDC20-DR-PRD-00063), the Source Control Framework detailed within the International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019) and the APPEA Australian Offshore Titleholder's Source Control Guideline (June 2021). The SCERP includes:<br>• Subsea First Response Toolkit (SFRT) Plan;<br>• Capping Stack Mobilisation Plan; and<br>• Relief Well Plan.<br>Refer directly to the SCERP for the implementation of all source control operations. |
| Response Strategies | RS2 – RS13 | Response Strategies are detailed guidance documents for the implementation of feasible response strategies identified by the Spill Impact Mitigation Assessment (SIMA) process. |
| Operational and Scientific Monitoring Bridging Implementation Plan (OSMBIP) (Appendix C) | BHPB-04PY-N950-0023 | This document is consistent with the APPEA Operational and Scientific Monitoring Bridging Implementation Plan Template (Rev A, March 2021) and acts as a Bridging Implementation Plan (BIP) to the Joint Industry OSMP Framework for petroleum activities undertaken by BHP Petroleum (Australia) Pty Ltd in the Pyrenees Field Development off the North-West coast of Western Australia. |

## 1.5 Spill Response Levels

To establish oil spill response arrangements that can be scaled depending on the nature of the incident by integrating with other local, regional, national and industry plans and resources, BHP uses a tiered response approach. The criteria for determining the hydrocarbon spill 'levels' for the purpose of the spill response have been adopted from the NatPlan and are described in Table 1-2. The 'level-rating' for oil spill response provides a magnitude description of the potential impact and the effort to support oil spill response.

The 'Level' is determined by the relevant Commander, such as the Field Response Team (FRT) Commander (for a small spill) or by the Incident Management Team (IMT) Incident Commander.

Typically, Level 1 spill responses can be resourced using MODU or shipboard spill kits. Vessels are required to maintain a current Shipboard Oil Pollution Emergency Plan (SOPEP) and appropriate spill kits, response capabilities and trained personnel. Likewise, designated ports and harbours are required to have as a minimum Level 1 response capability on site.

For Level 2 / Level 3 spills, BHP maintains a broad set of spill response capabilities. BHP also has contracts and Memorandum of Understanding (MoU's) with National and International third-party spill response providers to ensure response capabilities can be drawn upon.

**Table 1-2: Spill incident classification used to inform response**

| Level | Level Definition | Activity Spill Scenarios |
|---|---|---|
| 1 | **An incident will have minor or limited impacts on the environment which can be controlled by the resources normally available onsite without the need to mobilise BHP IMT or other external resources.** | |
| | An incident:<br>• Occurs within a single jurisdiction;<br>• Simple Incident Action Plan (IAP) required;<br>• Resourced from within one area;<br>• Environmental would be isolated and/or natural recovery expected within weeks;<br>• Wildlife impacts limited to individual fauna;<br>• That has no immediate concern of shoreline impact; and<br>• With a BHP Risk Matrix Consequence Level 1-2. | Refined oil/ hazardous chemicals (e.g. surface release from hose / container / drum etc.) |
| 2 | **An incident will have substantial impacts to the environment and cannot be controlled by the use of onsite resources alone and required external resources and support to combat the situation.** | |
| | An incident:<br>• Occurs across multiple jurisdictions;<br>• Outline of the IAP required;<br>• Requires intra-state resources;<br>• Significant environmental impacts, recovery may take months, remediation required;<br>• Wildlife impacts to groups of fauna or threatened fauna;<br>• Shoreline impact is expected; and<br>• With a BHP Risk Matrix Consequence Level 3+. | Marine diesel oil (MDO) spill from vessel collision (330 $m^3$ MDO)<br>or<br>Loss of flowline inventory (77 $m^3$ crude oil) |
| 3 | **An incident will have serious impacts to the environment and occurs across multiple/ international jurisdictions and requires mobilisation of state, national or international resources and support to combat the situation.** | |
| | An incident:<br>• Occurs across multiple / international jurisdictions;<br>• Detailed IAP required; | Loss of well control (156,774 $m^3$ crude oil) |

| Level | Level Definition | Activity Spill Scenarios |
|---|---|---|
| | • Requires national / international resources;<br>• Significant environmental area impacted, recovery may take months, remediation required;<br>• Wildlife impacts to large numbers of fauna;<br>• With a BHP Risk Matrix Consequence Level 4+. | |

## 1.6 Worst-Case Discharge Scenarios & Hydrocarbon Properties

There are three worst-case discharge (WCD) scenarios that have been identified (refer Table 1-3):

- Subsea release of hydrocarbons from the Stickle-4H1 production well;
- Subsea release of hydrocarbons from a flowline resulting from a dropped object; or
- Surface release of marine diesel oil (MDO) from a vessel collision.

**Table 1-3: Summary of worst-case hydrocarbon spill scenarios**

| Scenario | Hydrocarbon Type | Worst-case Maximum Spill Volume | Comment | Response Level | EP Section |
|---|---|---|---|---|---|
| Subsea release of crude oil from a loss of containment from the Stickle-4H1 well. | Stickle crude | Crude: 0.986 MMbbl (156,774 $m^3$) (Gas: 192.5 MMscf) over 69 days | Maximum credible volume modelled with highest flow LOWC with both horizontal laterals (L1 and L2) completed with screens and open to flow. | 3 | 8.3 |
| Subsea release of crude oil from Crosby or Stickle subsea flowline due to rupture from dropped object or anchor drag. | Pyrenees crude | ~77 $m^3$ over 1 hour | Maximum credible volume based on loss of inventory of flowline with >90% water-cut. | 2 | 8.4 |
| | Stickle crude | ~18 $m^3$ over 1 hour | | | |
| Surface release of MDO from fuel tank rupture on AHTS vessel due to collision. | Marine diesel oil | 330 $m^3$ over 6 hours | Maximum credible volume based on largest fuel tank capacity on AHTS vessel. | 2 | 8.5 |

Table 1-4 presents the hydrocarbon properties for Pyrenees, Stickle Crude and Marine Diesel Oil.

**Table 1-4: Hydrocarbon properties**

| Parameter | Pyrenees Crude Oil [1] | Stickle Crude Oil [2] | Marine Diesel Oil [3] |
|---|---|---|---|
| API Gravity | 19.3 | 18.7 | 0.843 |
| Wax Content (%) | 0.5 | 0.5 | 0.05 |
| Pour Point (°C) | -30 | - | -36 |
| Asphaltene (%) | 0.5 | 0.4 | 0.05 |
| Specific Gravity | 0.9384 | 0.89 | 36.4 |
| Viscosity (cP) | 59.13 @ 40°C | 24.1 @ 62°C | 3.9 @ 20°C |

Note 1: Data from Intertek (2011)

Note 2: Data from Core Laboratories (2004)

Note 3: Data from SINTEF's Marine Diesel IKU

# 2 Jurisdictional Authority and Control Agency

Any agency which has jurisdictional or legislative responsibilities for maritime environmental emergencies is obligated to work closely with the Control Agency to ensure that incident response actions are adequate.

In the event of an oil spill, Control Agencies are assigned to respond to the various levels of spills is outlined in Table 2-1. The 'Statutory Agency' and 'Control Agency' are defined as follows:

> **Jurisdictional Authority:** *the State or Commonwealth Agency assigned by legislation, administrative arrangements or within the relevant contingency plan, to control response activities to a maritime environmental emergency in their area of jurisdiction.*
>
> **Control Agency:** *is the agency with operational responsibility in accordance with the relevant contingency plan to take action to respond to an oil and/or chemical spill in the marine environment.*

**Table 2-1: Statutory and lead control agencies for oil spill pollution incidents**

| Area | Spill Source | Jurisdictional Authority | Lead Control Agency | |
|---|---|---|---|---|
| | | | Level 1 | Level 2/3 |
| Commonwealth Waters | Offshore Petroleum Activity | NOPSEMA | BHP | BHP |
| | Vessels | AMSA | AMSA | AMSA |
| State Waters | Offshore Petroleum Activity | WA DoT | BHP | WA DoT |
| | Vessels | WA DoT | BHP | WA DoT |
| Port Waters | Vessels | Port Authority | Port Authority / WA DoT | Port Authority / WA DoT |

## 2.1 Cross Jurisdictional Arrangements

Detailed cross jurisdiction arrangements are available in the WA State Hazard Plan - Maritime Environmental Emergencies (SHP-MEE) (WA DoT, 2021) and the described in the Western Australia Department of Transport (WA DoT) Marine Oil Pollution: Response and Consultation Arrangements (WA DoT, 2020).

Cross Jurisdictional arrangements described in these documents are summarised as follows:

- WA DoT will only assume the role of Controlling Agency for that portion of the response that occurs within State waters as per its jurisdictional responsibilities. The WA DoT's Marine Safety General Manager is the Hazard Management Agency (HMA) for the Marine Oil Pollution (MOP) hazards in State waters.
- WA DoT will nominate an Officer to facilitate and aligned communications, share situation awareness and coordinate response actions with the BHP IMT.
- WA DoT also establishing an Incident Control Centre (ICC) in Fremantle providing a number of emergency management support personnel to work within the WA DoT IMT (the BHP IMT would still function and lead the response in Commonwealth waters and liaise with WA DoT IMT).
- To facilitate the overarching coordination between the two Controlling Agencies and their respective IMT's, a Joint Strategic Coordination Committee (JSCC) will be established (Figure 2-1). The JSCC will be jointly chaired by the State Emergency Management Committee (SEMC) and the BHP's nominated senior representative and will comprise of individuals deemed necessary by the chairs to ensure an effective coordinated response across both jurisdictions.
- WA DoT may provide a Liaison Officer to BHP where State waters may be impacted by a spill event.

The Response and Consultation Arrangements (WA DoT, 2020) provides a series of tools to facilitate the interface between the WA DoT and a Petroleum Titleholder (in this case BHP) IMT. These include:

- Incident Control Transfer Checklist (State waters)
- IMT Functions and 'Lead IMT' Designations
- Initial WA DoT IMT Personnel Requirements upon Petroleum Titleholders
- Initial Petroleum Titleholder CMT/IMT Personnel Requirements upon WA DoT
- Marine Oil Pollution (MOP) Incident Notification Flowchart.

BHP will adhere to the IMT functions and Lead IMT designations as described in Appendix 2 of the Offshore Petroleum Industry Guidance Note - Marine Oil Pollution: Response and Consultation Arrangements (WA DoT, 2020).

BHP will continue to provide initial response actions for State waters, until such time that WA DoT assumes control, and subsequently will provide resources in line with the BHP organisation chart and the OPEP.

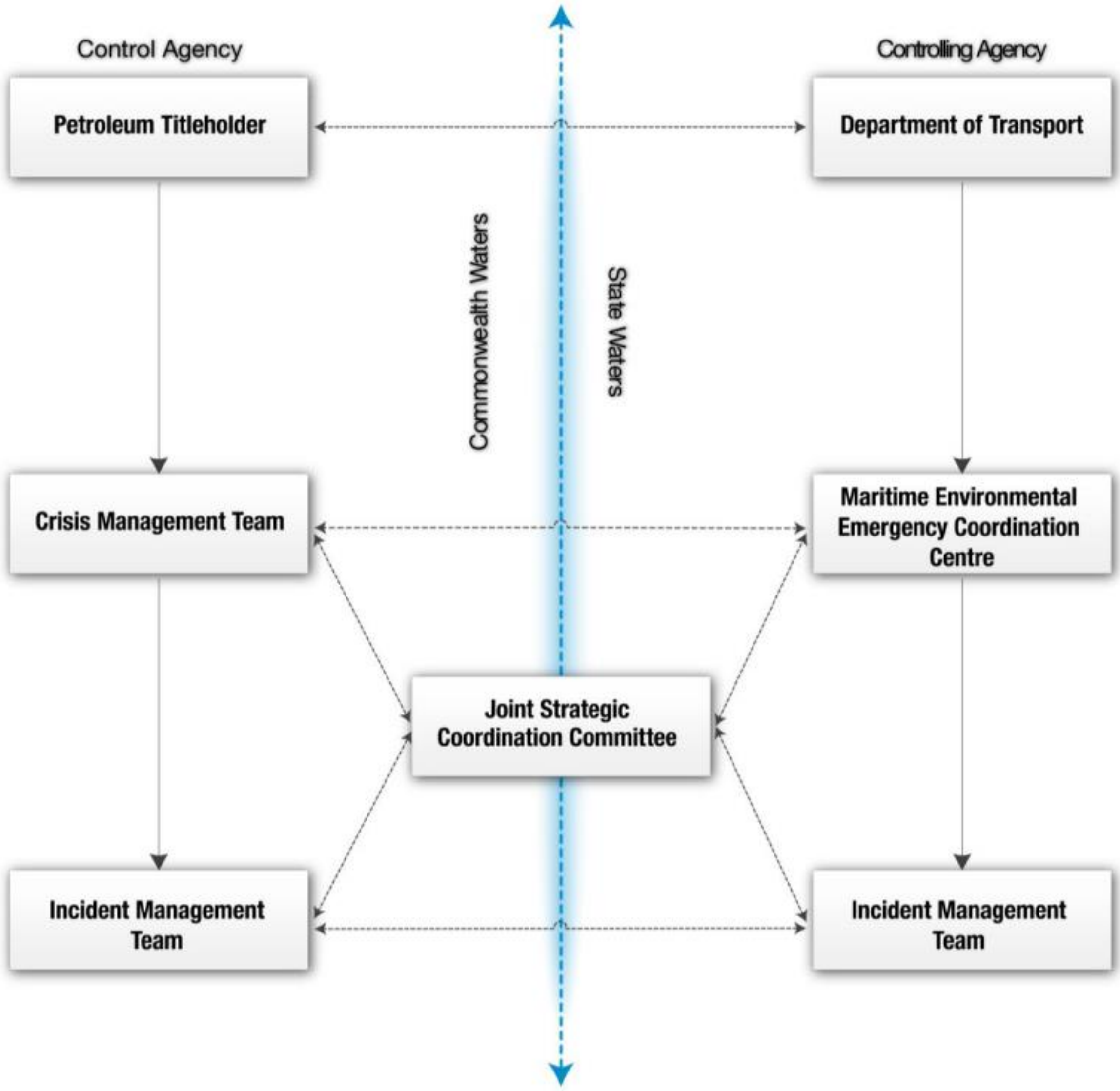



**Figure 2-1: Incident management structure for Commonwealth waters Level 2/3 spill incidents entering State waters**

Figure 2-2 outlines the control structure in the event of that the marine oil pollution incident has, or has the potential to, impact State waters.

BHP will use its existing IMT Control Room in Perth.

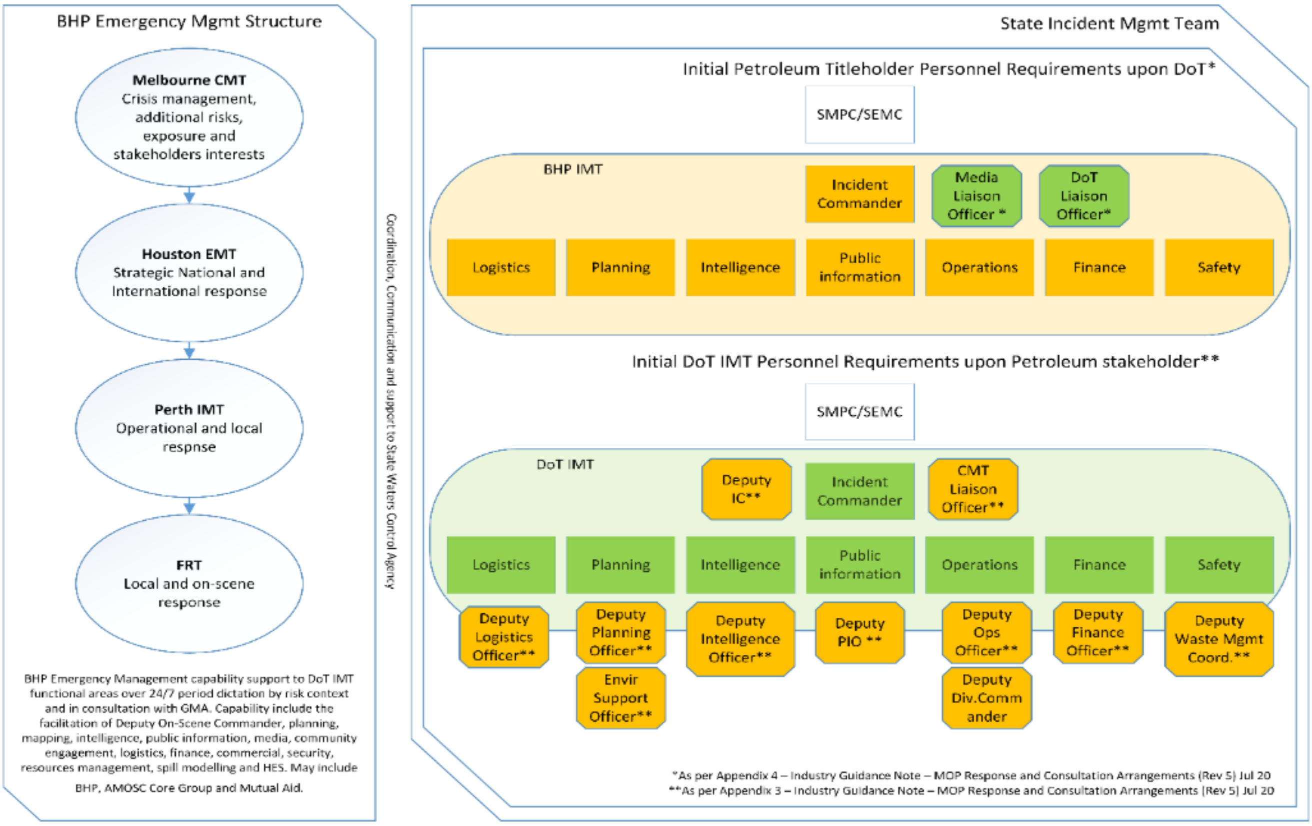



**Figure 2-2: Emergency management support to State waters Control Agency – as per WA DoT IGN requirements**

# 3 Notification and IMT Activation

## 3.1 Initial Spill notifications

For all spills to the marine environment, the MODU Offshore Installation Manager (OIM) and/or Vessel Master must immediately notify the BHP Drilling Supervisor and/or BHP Head of Drilling & Completions - Australia.

For Level 2/3 spills, the BHP Drilling Supervisor and/or Head of Drilling & Completions - Australia must notify the BHP Emergency and Crisis Centre (ECC) – see Section 3.3 'IMT Activation' below.

It is the responsibility of the BHP Lead Principal HSE to ensure that reporting of environmental incidents meets both regulatory reporting requirements and BHP HSEC Standards.

## 3.2 External Agency Notification

All hydrocarbon spills must be reported to external agencies as providing in the following sub-sections.

### 3.2.1 NOPSEMA

The BHP Drilling Superintendent (or delegate) is responsible for reporting all hydrocarbon spills >80L orally to NOPSEMA, as soon as practicable, and in any case not later than 2 hours after the first occurrence of the reportable incident; or if the reportable incident was not detected at the time of the first occurrence, the time of becoming aware of the reportable incident.

Oral notifications of a reportable incident to NOPSEMA will be via telephone: 1300 674 472.

The oral notification must contain:

- All material facts and circumstances concerning the reportable incident known or could be obtained by reasonable search or enquiry; and
- Any action taken to avoid or mitigate any adverse environment impacts of the reportable incident; and
- The corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident.

### 3.2.2 AMSA

For vessel spills, and in accordance with the *Navigation Act 2012*, any oil pollution incidents in Commonwealth waters will be reported by the Vessel Master to AMSA within 2 hours via the national emergency notification contacts and a written report within 24 hours of the request by AMSA. The national 24-hour emergency notification contact details are:

Freecall: 1800 641 792

Fax: (02) 6230 6868

Email: mdo@amsa.gov.au

### 3.2.3 DoT / DMIRS / DBCA

The Vessel Master / BHP Drilling Superintendent (or delegate) is responsible for reporting any oil pollution incident affecting or likely to affect State waters to the Oil Spill Response Coordination (OSRC) Unit within the Department of Transport (WA DoT) as soon as practicable (within 2 hours of spill occurring) via the 24 hour reporting number (08) 9480 9924. The Duty Officer will then advise whether the following forms are required to be submitted:

- Marine Pollution Form (POLREP)

  http://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf and/ or

- Marine Pollution Situation Report (SITREP)

  http://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf

All oil pollution incidents likely to affect WA Waters to be reported by the Vessel Master / BHP Drilling Superintendent (or delegate) to the Department of Mines, Industry Regulation & Safety (DMIRS) Emergency Incident Phone (0419 960 621) and in writing to: petroleum.environment@dmirs.wa.gov.au

BHP Drilling Superintendent (or delegate) is responsible for notifying Department of Biodiversity, Conservation & Attractions (DBCA) duty officer on (08) 9219 9108 if the spill has the potential to impact State Marine Parks or has impacted wildlife in State waters (to activate Oiled Wildlife Advisor), as well as notifying the DBCA Pilbara regional office (08) 9182 2000 as soon as practicable.

### 3.2.4 DNP

Director of National Parks (DNP) must be made aware of oil/gas pollution incidences that occur within an Australian Marine Park (Commonwealth) or are likely to impact on a Marine Park as soon as possible. Notification should be made to:

Marine Compliance Duty Officer on 0419 293 465 (24 hours).

The notification should include:

- titleholder details;
- time and location of the incident (including name of Marine Park likely to be effected);
- proposed response arrangements as per the Oil Pollution Emergency Plan (e.g. dispersant, containment, etc.);
- confirmation of providing access to relevant monitoring and evaluation reports when available; and
- contact details for the response coordinator.

## 3.3 IMT Activation

For Level 1 incidents, the MODU OIM and/or AHTS Vessel Master responds to the incident and immediately notifies the BHP Drilling Supervisor and/or Head of Drilling & Completions - Australia.

For Level 2/3 incidents, the MODU OIM and/or AHTS Vessel Master immediately notifies the BHP Drilling Supervisor and/or Head of Drilling & Completions - Australia who as soon as possible notifies the BHP Emergency and Crisis Centre (ECC). The ECC is located in Houston and provides dedicated emergency response communications and co-ordination 24 hours a day, 365 days per year. ECC Contact details:

ECC toll free 24 Hour Hotline: 0011 1 713 430 7469

Australian Free Call number is 1800 139 613

Email: securitycallcenter@uhcglobal.com

BHP will use its existing IMT Control Room in Perth to house the IMT and mount a local response.

## 3.4 IMT Emergency Contacts Directory

IMT to initiate engagement as per APU Emergency Contact Directory (AOHSE-0002-005) available via EMQnet.

## 3.5 Oil Spill Response Agencies (OSRA)

BHP maintains contracts with a number of Oil Spill Response Agencies (OSRAs):

### 3.5.1 AMOSC

IMT can request the assistance of AMOSC Duty Manager (24/7): 0438 379 328

AMOSC can be placed on the levels of advice listed in Table 3-1.

Should the response require mutual aid from equipment owned and personnel employed by another company, the request for assistance is made directly company to company via each company's nominated Mutual Aid Contact.

IMT can contact AMOSC to activate the Standing Agreement (92032701.WP5) and the Service Contract (for the borrowing company), in the event that BHP require equipment from another company.

**Table 3-1: AMOSC advice levels**

| AMOSC Advice Level | Status | AMOSC Requirements |
|---|---|---|
| Level 1 | Forward Notice | Advise a potential problem.<br>Provide or update data on oil spill.<br>Update information on spill and advise 4 hourly. |
| Level 2 | Standby | AMOSC resources may be required.<br>Assessment of resources and destination to be made.<br>Update information on spill and advise 2 hourly. |
| Level 3 | Callout | AMOSC resources are required.<br>Detail required resources and destination. |

### 3.5.2 Oil Spill Response Limited (OSRL)

BHP is a member of the OSRL group. OSRL have capacity to mobilise additional equipment and personnel to APU from their Singapore location. Only nominated BHP personnel may request the assistance of OSRL via the IMT Leader under OSRL's Service Level Agreement (SLA).

OSRL Singapore Duty Manager (24/7): +65 6266 1566

OSRL also has a Memorandum of Understanding (MoU) with AMOSC, and OSRL may also be activated by AMOSC to provide resources to AMOSC to respond to a situation. Following initial spill notification, OSRL may be mobilised if required within 8 hours.

### 3.5.3 Well Control Specialists

Perth-based BHP employees will fill the roles of Source Control Section Chief and the Relief Well Group Supervisor. BHP has retained Integrity Management & Response (IMR) to staff SIMOPS Group Supervisor, Well Capping Group Supervisor, and Flow Engineering Group Supervisor roles and associated functions reporting to those roles.

IMR will fulfil these roles remotely from their dedicated Emergency Operations Centre (EOC) in Houston, USA and link into the Perth-based BHP IMT and Source Control Section Chief virtually via platforms such as Microsoft Teams or Webex. Contact (24/7): +1 (866) 578-7253

BHP has a contract in place with The Response Group, located in USA, for the provision of oil spill response personnel and resources to support the IMT Source Control Section. Contact (24/7): +1 (281) 880-5000.

### 3.5.4 Technical Support (Environmental Monitoring)

BHP maintains a list of pre-approved vendors (OSM Service Providers) who can be called upon at short notice to provide environmental monitoring services in the evnt of an oil spill. Refer APU Emergency Contact Directory (EMQnet) for details.

BHP has a Service Level Agreement (SLA) with OSRL under which a framework agreement enables CSA Ocean Sciences to provide in-field SSDI monitoring services.

# 4 Applicable Response Strategies

A summary of the Response Strategies selected during the strategic SIMA process and their applicability to various spill scenarios is presented in Table 4-1.

Details for the implementation of each applicable Response Strategy including first-strike actions and associated Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and measurement criteria are presented in Section 6.

A working copy of the first strike plan in spreadsheet format allows the IMT and functional groups to execute the plan within the IMT environment. The First Strike Plan covers the first 24 hours of activity during the initial response phase.

A copy of the editable spreadsheet is available in the APU IMT Fast Facts section of EMQnet.

Supporting information regarding response capability and environmental impacts and risks can be found in Appendix B – OPEP: Basis of Design and Field Capability Analysis.

**Table 4-1: Applicable response strategies for Pyrenees Phase 4 spill scenarios**

| Response Strategy | 330m$^3$ Diesel Loss from Vessel Storage Tank (Level 2) | 77 m$^3$ Crude Flowline Content Loss (Level 2) | 156,774 m$^3$ Crude Loss of Containment (Level 3) |
|---|---|---|---|
| RS1.1: Source Control – Vessel-based | ✓ | ✗ | ✗ |
| RS1.2: Source Control – Subsea Intervention | ✗ | ✓ | ✓ |
| RS1.3: Source Control – Relief Well | ✗ | ✗ | ✓ |
| RS1.4: Source Control – Capping Stack | ✗ | ✗ | ✓ |
| RS1.5: Source Control – Subsea First Response Toolkit (SFRT) | ✗ | ✓* | ✓ |
| RS2: Monitor and Evaluate | ✓ | ✓ | ✓ |
| RS3.1: Dispersant - Surface Application | ✗ | ✓ | ✓ |
| RS3.2: Dispersant – Subsea Application | ✗ | ✗** | ✓** |
| RS4: Marine Recovery | ✗ | ✓ | ✓ |
| RS5: Shoreline Protection | ✓* | ✓ | ✓ |
| RS6: Mechanical Dispersion | ✗ | ✗ | ✓ |
| RS7: In-Situ Burning | ✗ | ✗ | ✗ |
| RS8: Shoreline Clean-up | ✓* | ✓ | ✓ |
| RS9: Natural Recovery | ✓ | ✓ | ✓ |
| RS10: Environmental Monitoring | ✓ | ✓ | ✓ |
| RS11: Oiled Wildlife Response | ✓ | ✓ | ✓ |
| RS12: Forward Command Post | ✓ | ✓ | ✓ |
| RS13: Oil Contaminated Waste Management | ✓ | ✓ | ✓ |

✓ Activate Response Strategy (Refer Section 6 for Response Strategy Implementation).
* Potentially activated depending on reports/observations of RS2 Monitor and Evaluate.
✗ Response Strategy not applicable for spill scenario.
** Potentially limited effectiveness due to moderate flow rates from well and low mixing rates of dispersant.

# 5 Resources at Risk

## 5.1 Environment that May Be Affected (EMBA)

Figure 5-1 represents the outer geographical boundaries of the environment that may be affected (EMBA) by potential hydrocarbon exposure from a combined 150 model simulations (stochastic modelling) run over all seasons at low, medium and high exposure thresholds. Modelling results presented in Section 5.1.1 and 5.1.2 below present potential worst-case shoreline exposures from selected simulations at actionable hydrocarbon thresholds.

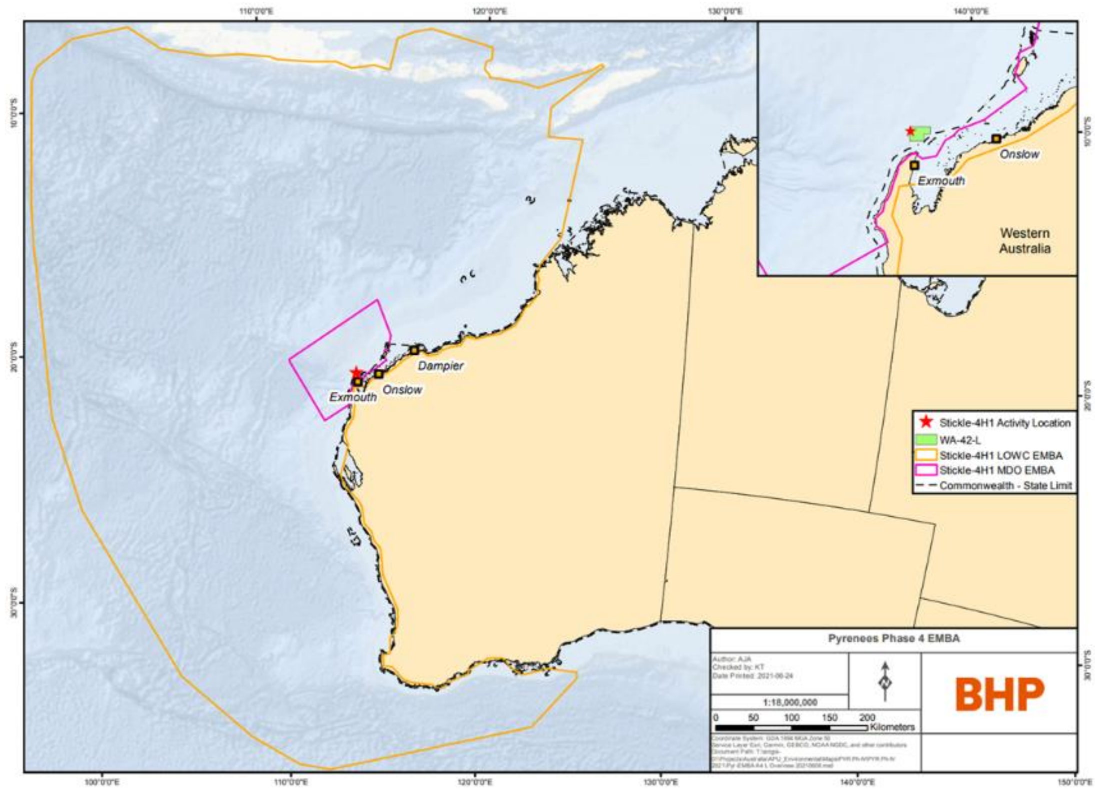



**Figure 5-1: EMBA for WCD crude and marine diesel oil spill scenarios**

### 5.1.1 Loss of Well Control (Crude)

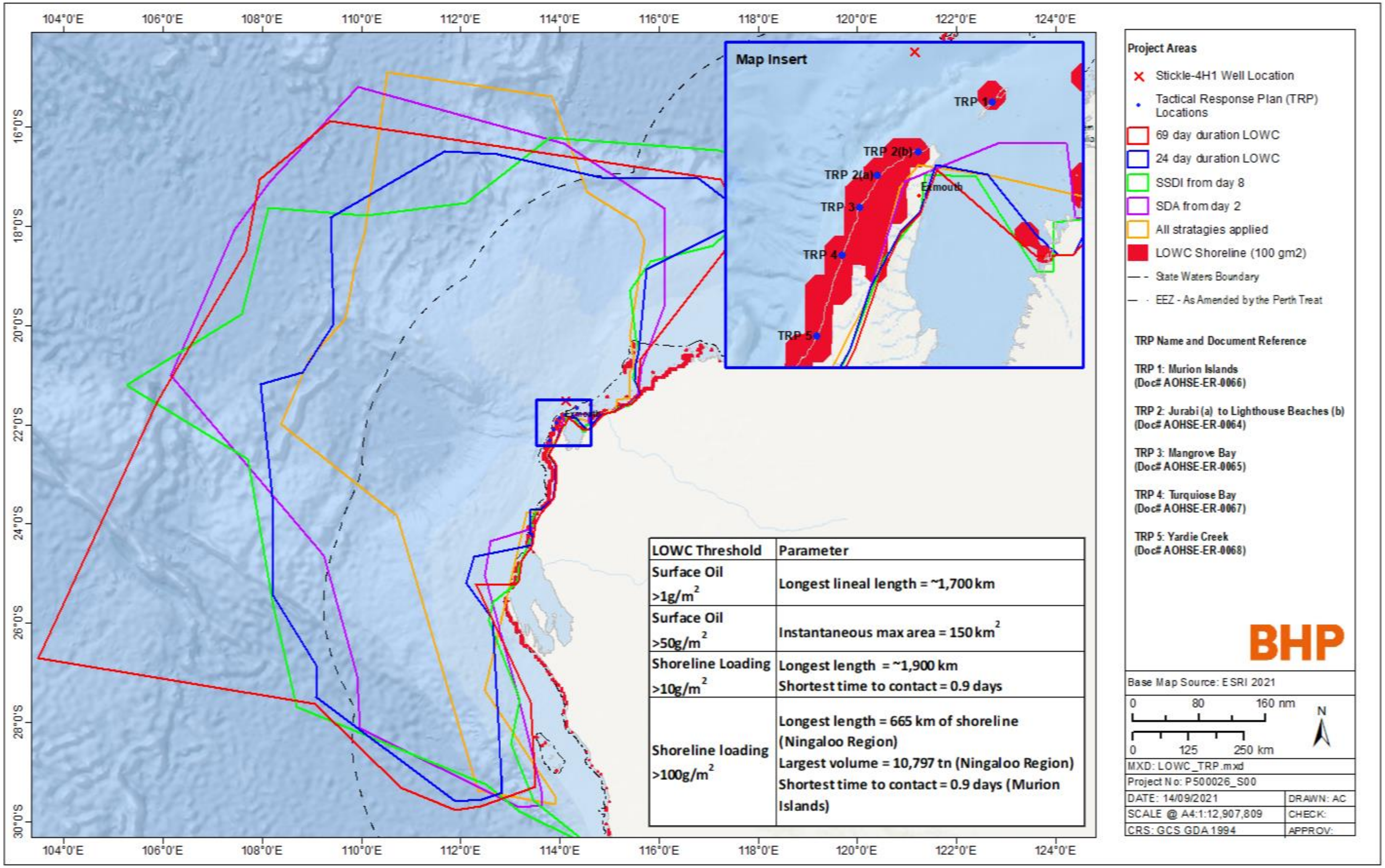
Reservoir modelling indicates that open-hole flow rates of Stickle crude oil would likely decrease from approximately 26,000 bbl/d down to approximately 8,300 bbl/d at day 69, when a dynamic well kill operation could be achieved. Modelling was conducted for a potential worst case discharge (WCD) 156,774 $m^3$ release of oil from the Stickle-4H1 well.

AMSA guidance indicates that wave action alone is sufficient to clean shorelines with thickness <100 $g/m^2$. The output maps demonstrate the probabilities and locations of shoreline thickness ≥100 $g/m^2$.

Table 5-1 provides worst-case deterministic spill modelling results that should be considered in the event of a LOWC scenario at Stickle-4H1 well location. These modelled simulations represent potential shoreline oiling outcomes for response planning purposes. Response Strategy RS2: Monitoring and Evaluation must be undertaken in the event of a Level 2 / Level 3 spill to inform actual spill trajectories and identify protection priorities via the Operational SIMA process.

**Table 5-1: Deterministic LOWC crude spill simulations (GHD, 2021)**

| Spill Scenario | Modelling Realisation | Start of Release | Potential Extent of Hydrocarbon Exposure |
|---|---|---|---|
| LOWC 69-day release | 1 | January | Highest accumulated shoreline loading at Ningaloo Region above moderate threshold (100 g/m$^2$) of 10,797 tonnes. The simulation also represents third highest accumulation across all shorelines of 14,797 tonnes and the 13th highest length of oiled shoreline of 665 km. The simulation also results in the following key outcomes:<br>2,665 tonnes at Onslow Region<br>620 tonnes at Barrow Island<br>358 tonnes at Muiron Islands<br>270 tonnes at Thevenard Island |
| | 94 | December | Shortest arrival time of oil accumulation above the moderate threshold (100 g/m$^2$) of **0.9** days at Muiron Islands and **2.6** days at Onslow Region with arrival at other receptors after 48 hours. |
| | 98 | January | The highest accumulated shoreline mass above the moderate threshold (100 g/m$^2$) of 18,370 tonnes across all shorelines, including the following key outcomes:<br>5,177 tonnes at Dampier Region<br>3,283 tonnes at Dampier Archipelago<br>2,788 tonnes at Onslow Region<br>2,665 tonnes at Barrow Island<br>2,236 tonnes at Hedland Region<br>728 tonnes at Montebello Islands<br>311 tonnes at Imperieuse Reef<br>270 tonnes at Clerke Reef<br>251 tonnes at Muiron Islands<br>This simulation also results in the third longest length of oiled shoreline of 895 km. |
| *Modelling indicates that the greatest potential for shoreline loading occurs during summer months from December to February* | | | |




| LOWC Threshold | Parameter |
|---|---|
| Surface Oil >1g/m$^2$ | Longest lineal length = ~1,700 km |
| Surface Oil >50g/m$^2$ | Instantaneous max area = 150 km$^2$ |
| Shoreline Loading >10g/m$^2$ | Longest length = ~1,900 km<br>Shortest time to contact = 0.9 days |
| Shoreline loading >100g/m$^2$ | Longest length = 665 km of shoreline (Ningaloo Region)<br>Largest volume = 10,797 tn (Ningaloo Region)<br>Shortest time to contact = 0.9 days (Murion Islands) |

**Figure 5-2: LOWC crude WCD deterministic modelling results (unmitigated & mitigated)**

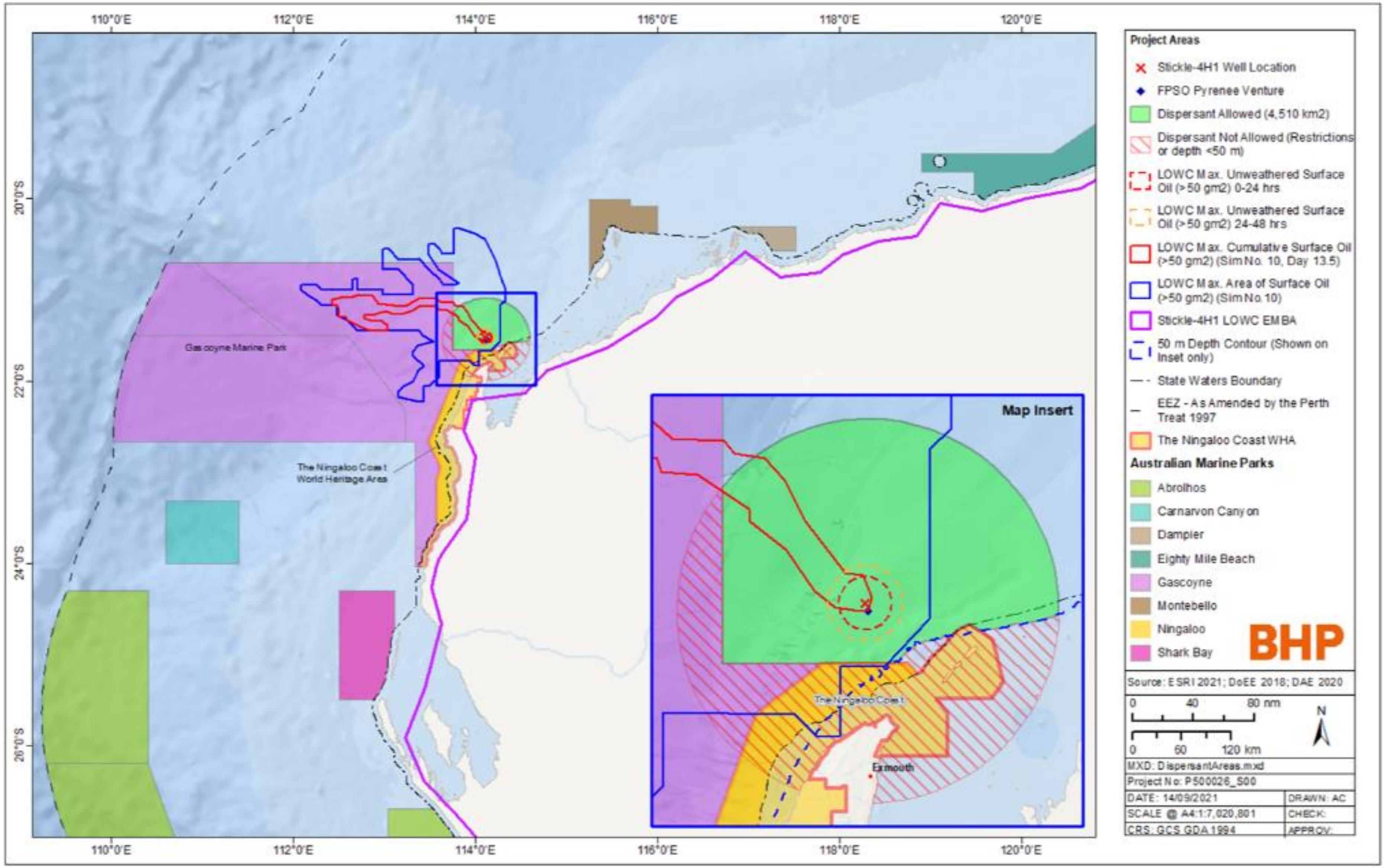



**Figure 5-3: LOWC crude WCD deterministic maximum daily surface oil area (km²) of surface oil thickness >50 µm**

### 5.1.2 Vessel Collision (MDO)

**Table 5-2: MDO spill potential shoreline and surface loading (GHD, 2021)**

| Spill Scenario | Potential Extent of Hydrocarbon Exposure |
|---|---|
| MDO Surface Release (over 6-hours) | Highest accumulated shoreline loading at Ningaloo Region above moderate threshold (100 g/m²) of **202 tonnes**. |
| | Highest accumulated shoreline mass above moderate threshold (100 g/m²) of **202 tonnes across all shorelines.** |
| | Minimum arrival time of oil to any shoreline above the moderate threshold (100 g/m²) of **0.7 days at Ningaloo Region**. |

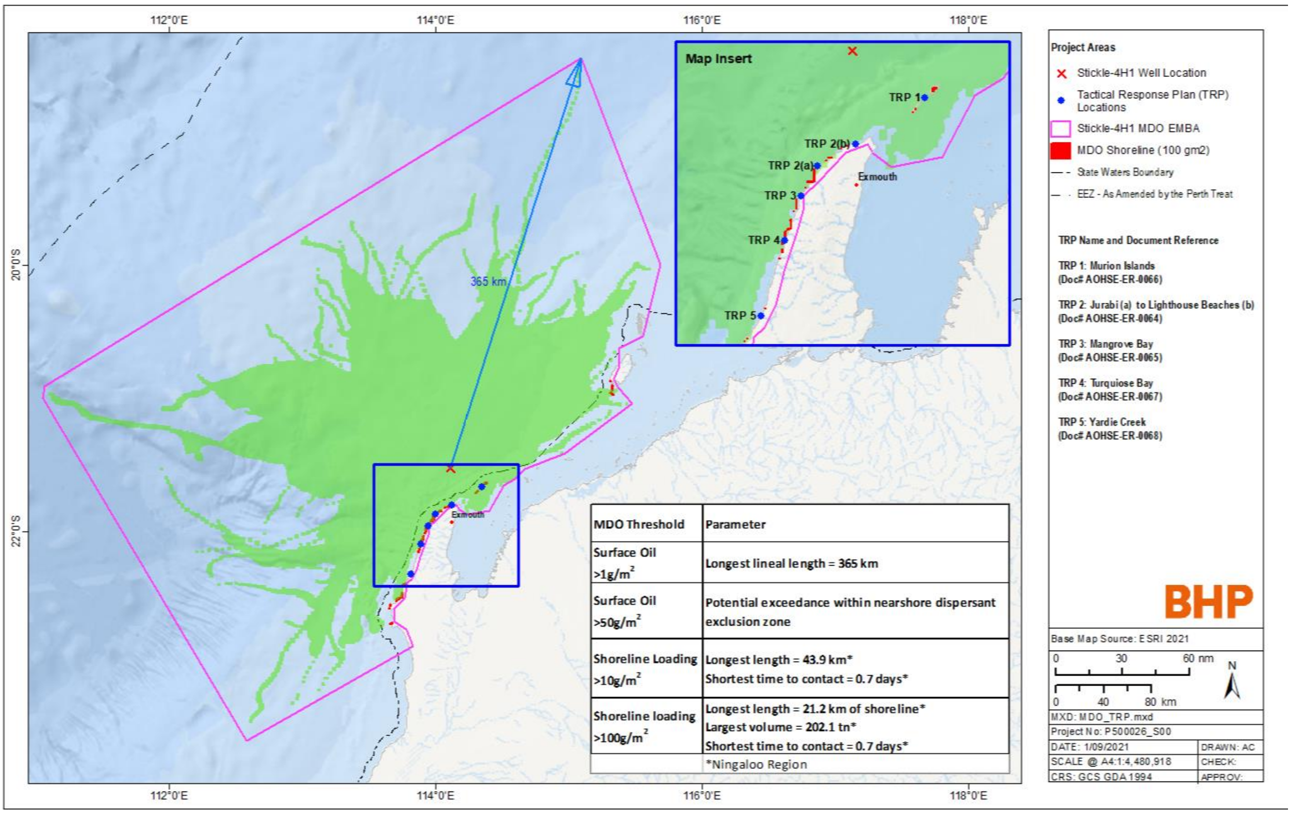



**Figure 5-4: MDO WCD modelling results**

## 5.2 Protection Priorities

For any oil spill entering or within WA State waters/shorelines, the WA Controlling Agency is the ultimate decision-maker regarding identification and selection of protection priorities.

The WA Controlling Agency will utilise their internal processes which typically includes the following:

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

The WA Controlling Agency will adjust/amend their internal processes to suit the spill situation at the time.

Additional information available to assist WA DoT identify and prioritise protection priorities include:

- Part A: Joint Carnarvon Basin Operators North-West Cape Sensitivities Mapping (June 2012) undertaken by AMOSC. The purpose of this shoreline sectorisation was to outline sensitive resources at risk, describe a baseline using the SCAT methodology, and outline important segment access information. The document describes localised environmental type (shoreline, substrate) and accessibility of shorelines, and permissions required;
- Section 4 (Description of the Environment) of the Pyrenees Phase 4 Infill Drilling Program EP – summarised in Table 5-3;
- EPBC Protected Matters searches undertaken to inform the environment that may be affected (EMBA) provided within the Pyrenees Phase 4 Infill Drilling Program EP; and
- Site-specific information detailed within a series of Tactical Response Plans (TRPs) developed based upon the probability, timing and extent of potential exposure hydrocarbons to identified sensitive receptors during a Level 2 / Level 3 spill event in the Pyrenees Field, these are:
    - Jurabi to Lighthouse Beaches Oil Spill Tactical Response Plan (AOHSE-ER-0064)
    - Muiron Islands Oil Spill Tactical Response Plan (AOHSE-ER-0066)
    - Turquoise Bay Oil Spill Tactical Response Plan (AOHSE-ER-0067)
    - Yardie Creek Oil Spill Tactical Response Plan (AOHSE-ER-0068)
    - Mangrove Bay Oil Spill Tactical Response Plan (AOHSE-ER-0065)

Additional tools available to WA DoT / BHP to evaluate protection priorities:

- GIS – Petroleum Incident Management

  This web based GIS modelling platform takes APU Basemap and overlays key sensitivities and other information in spatial format.

- GIS – APU Oil Spill Response Plan

  This web-based GIS modelling platform takes NW Cape-Sector Map, and allows a display of shore concentration by time and priority. For selected scenarios, it also provides data ‘graphs’ such as total shore volume by priority, oil load at each segment over time and protection priority and number of responders required by segment for selected OPEPs.

**Table 5-3: Environmental sensitivities summary**

| Priority | Refer to EP Section |
|---|---|
| World Heritage Properties | 4.5.2 |
| National Heritage Properties | 4.5.3 |
| Commonwealth Heritage Places | 4.5.4 |
| Wetlands of International Importance | 4.5.5 |
| Wetlands of National Importance | 4.5.6 |
| Threatened Ecological Communities | 4.5.7 |
| Species Recovery Plans, Conservation Advice and Threat Abatement Plans | 4.5.8 |
| Biologically Important Areas and Critical Habitats | 4.5.8 |
| Listed Threatened Species | 4.6.1 |
| Listed Migratory Species | 4.6.2 |
| Marine Parks and Marine Management Areas | 4.10.2 |
| Key Ecological Features | 4.10.3 |
| Fisheries | 4.11.3 |

## 5.3 Sensitivities of Resources at Risk

The location of environmental receptors and high conservation species, oil toxicity information, and the impact and risk assessment for potential oil pollution events are provided in the Pyrenees Phase 4 Infill Drilling Program EP (Section 8). To support development of this OPEP, the environmental resources (receptors) have been ranked based on their sensitivity. The ranking has then been used to assist prioritisation of oil spill response techniques or allocation of resources (Table 5-4).

**Table 5-4: Sensitivity ranking of resources at risk and response strategy objective**

| Sensitivity Ranking | Open Ocean | Shallow Water | Response Objective |
|---|---|---|---|
| **Extreme** | N/A | Migratory shorebirds and their habitat | The EMBA intersects with migratory shorebirds and their habitats. Shoreline response measures will be put in place to manage the impact to this extremely sensitive environment. |
| | N/A | Mangroves | The EMBA intersects with mangrove habitats and therefore is a priority area for response strategies such as protect and deflect booming. |
| **High** | Marine mammals (whales, dolphins, dugongs) | Marine mammals (whales, dolphins, dugongs) | It has been identified that marine mammals may be present within the EMBA for all levels of a spill. The purpose of the response measures will be to manage these impacts by removing observable and detectable spilt hydrocarbons to the marine environment. |
| | Avifauna | Avifauna | There are many species of seabirds and shorebirds within the EMBA that could be affected by an oil spill. Response strategies will be to undertake oiled wildlife response and shoreline protection / response, therefore impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons. |
| | Marine reptiles (e.g. turtles) | Marine reptiles (e.g. turtles) | Known turtle foraging and nesting habitat occurs in the Ningaloo Marine Park and throughout the broader area. Additional impacts to turtles would be from shoreline accumulated hydrocarbons during a spill on nesting beaches during nesting season. Response strategies will be to undertake oiled wildlife response and shoreline protection / response, therefore impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons. |
| | N/A | Corals and macroalgae (incl. seagrass beds) | Smothering is expected to be the primary mechanism for harm. Reef flats and intertidal areas may be exposed to direct oiling if the oil becomes stranded as the tide falls. The best assessed course of action for remediation of corals and macroalgae from smothering is to allow natural wave energy to assist in the natural dispersion of weathered oil, any mechanical recovery or dispersant use may only increase the impact to the reef system (IPIECA, 1990-2005 Volume 3). |
| | Whale sharks | N/A | The purpose of the response measures will be to manage these impacts with all reasonable efforts to remove hydrocarbons. |
| | Fishes | Fishes | There are fish and fish habitat within the EMBA that could be affected by an oil spill. Response strategies will be to undertake shoreline protection / response, where possible, therefore impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons. |
| | Fisheries | Fisheries | There are many fisheries within the EMBA that could be affected by an oil spill. Response strategies will be to undertake marine recovery and shoreline response, therefore impacts to fisheries will be managed by all reasonable efforts to remove hydrocarbons. |

| Sensitivity Ranking | Open Ocean | Shallow Water | Response Objective |
|---|---|---|---|
| **Moderate** | N/A | Sandy beaches | High amenity beaches occur throughout the Ningaloo Marine Park. Shoreline protection / response will be undertaken so that impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons. |
| | N/A | Rocky shores | Shoreline response will be undertaken so that impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons. |

# 6 Response Strategy Implementation

## 6.1 RS1.1 Source Control – Vessel-based

### Response Implementation

**Table 6-1: Response implementation – Source control: vessel-based**

| RS1.1 Source Control – Vessel-based | |
|---|---|
| **Response Objective** | Halt the discharge of hydrocarbons to the marine environment |
| **Initiation Criteria** | Vessel spill (Level 1 / 2 / 3) |
| **Responsible** | Vessel Master |
| **Controlling Agency** | AMSA |
| **Emergency Contact** | AMSA national 24-hour emergency notification contact details are:<br>Freecall: 1800 641 792<br>Fax: (02) 6230 6868<br>Email: mdo@amsa.gov.au |
| **Activation Time** | ASAP |
| **Implementation Plan / Guidance Document** | MARPOL-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) or Shipboard Marine Pollution Emergency Plan (SMPEP - for noxious liquid) – the latter may be combined with a SOPEP. |
| **Termination Criteria** | Discharge controlled. |

### First Strike Plan

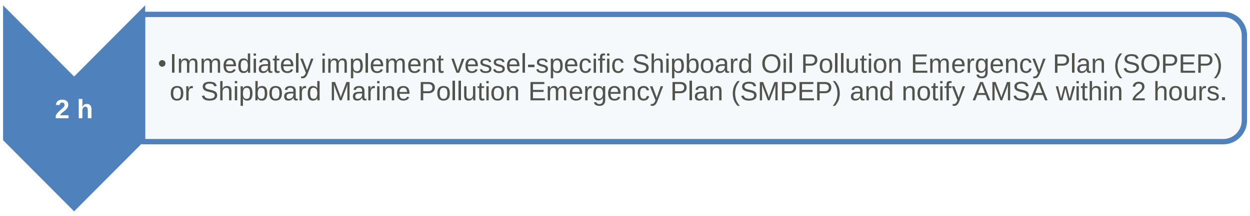



**Figure 6-1: First strike plan – Source control: vessel-based**

## Environmental Performance Standards

Table 6-2 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of vessel-base source control response strategy.

**Table 6-2: Environmental performance – Source control: vessel-based**

| RS1.1 Source Control – Vessel-based | | |
|---|---|---|
| **Environmental Performance Outcome** | **Reduce, control or halt the discharge of hydrocarbons in a timely manner by the implementation of source control methods.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| Vessel Master to report spill to AMSA within 2 hours of incident. | Vessel incident report records | Vessel Master |
| Vessel-based source control shall be managed in accordance with vessel-specific (SOPEP/SMPEP for vessels, in line with MARPOL Annex I). | Vessel incident records | Vessel Master |
| Response shall only terminate when discharge has been controlled. | Vessel incident records | Vessel Master |

## 6.2 RS1.2 Source Control – Subsea Intervention

### Response Implementation

**Table 6-3: Response implementation – Source control: subsea intervention**

| RS1.2 Source Control – Subsea Intervention | |
|---|---|
| **Response Objective** | Halt the discharge of hydrocarbons to the marine environment |
| **Initiation Criteria** | Crude release (Level 1 / 2 / 3) |
| **Responsible** | FPSO OIM (BHP Flowline) / MODU OIM (LOWC) |
| **Controlling Agency** | BHP |
| **Emergency Contact** | Pyrenees Venture OIM |
| **Refer APU Emergency Contact Directory (EMQnet)** | Diamond Ocean Apex OIM |
| **Activation Time** | Within 2 hours of incident. |
| **Implementation Plan / Guidance Document** | Pyrenees Critical Equipment Performance Standard – Safety Shutdown System (PYHSE-RM-0001-0004).<br>MODU Safety Case / Well Control Procedures. |
| **Termination Criteria** | Discharge controlled and barriers reinstated. |

### First Strike Plan – Flowline Rupture

**2 h**
- Operations to confirm spill status with OIM.
- OIM to initiate Emergency Shutdown as per Pyrenees Critical Equipment Performance Standard – Safety Shutdown System (PYHSE-RM-0001-0004).
- OIM to notify IMT and request Tier 2 support.
- IMT to notify MODU OIM and provide situation update.

**8 h**
- OIM to update IMT on spill size, volume and situation.
- IMT to develop IAP for Tier 2 support.
- IMT to mobilise Tier 2 support as per IAP.

**16 h**
- OIM to update IMT on spill size, volume and situation.

**24 h**
- IMT to complete daily safety analysis for the next 24 h period.
- IMT to revise IAP for Tier 2 support.

**>24 h**
- Complete daily safety analysis for the next 24 h period.
- Carry out source control requirements as per IAP.

**Figure 6-2: First strike plan – Source control: subsea intervention (flowline rupture)**

## First Strike Plan – LOWC

**2 h**

- MODU IC to initiate ESD as per MODU Safety Case / Well Control Procedures.
- MODU IC to liaise with BHP Drilling Supervisor aboard MODU regarding Tier 2 support as required.
- BHP Drilling Supervisor to notify FPSO OIM and BHP IMT and request Tier 2 support.
- BHP IMT to initiate and faciliate Tier 2 support request - see RS1.5 if SFRT required.

**8 h**

- OIM to update IMT on spill size, volume and situation.
- BHP IMT to develop IAP for Tier 2 support.
- BHP IMT to mobilise Tier 2 support as per IAP.

**16 h**

- MODU IC to update BHP IMT on spill size, volume and situation.

**24 h**

- BHP IMT to complete daily safety analysis for the next 24 h period.
- BHP IMT to revise IAP for Tier 2 support.

**>24 h**

- Complete daily safety analysis for the next 24 h period.
- Carry out source control requirements as per IAP.

**Figure 6-3: First strike plan – Source control: subsea intervention (LOWC)**

## Environmental Performance Standards

Table 6-4 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of subsea intervention source control response strategy.

**Table 6-4: Environmental performance – Source control: subsea intervention**

| RS1.2 Source Control – Subsea Intervention | | |
|---|---|---|
| **Environmental Performance Outcome** | **Discharge of hydrocarbons to the marine environment halted via source control** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate subsea intervention for any crude release from subsea infrastructure. | Incident log | IMT (IC) |
| BHP shall undertake all subsea intervention tasks within the defined timeframes as per the subsea intervention first strike plan. | Incident log / communication records | IMT (IC) |
| MODU IC shall initiate Emergency Shutdown as per MODU Safety Case / Well Control Procedures for any LOWC scenario where MODU is connected to well, the MODU is operable and it is safe to do so. | Incident log / communication records | MODU IC |
| In the event of a loss of flowline inventory within the Pyrenees Field, the FPSO OIM shall initiate ESD as per Pyrenees Critical Equipment Performance Standard – Safety Shutdown System (PYHSE-RM-0001-0004) within 2 hours of release.<br>Specifically, Emergency Shutdown functions will be implemented to safeguard the process from escalation due to an upset condition beyond safe limits, including isolation of sections of the production process and related equipment, shutdown of related utility systems, de-energising hazardous electrical power, initiation of alarms and minimise loss of hydrocarbon containment. | Incident log / communication records | FPSO OIM (IC) |
| Response shall only terminate when discharge has been controlled and barriers reinstated. | Incident log | IMT (IC) |

## 6.3 RS1.3 Source Control – Relief Well

### Response Implementation

**Table 6-5: Response implementation – Source control: relief well**

| RS1.3 Source Control – Relief Well | |
|---|---|
| **Response Objective** | Halt the discharge of hydrocarbons to the marine environment |
| **Initiation Criteria** | LOWC (Level 3) |
| **Responsible** | BHP IMT (Source Control Section Chief) |
| **Controlling Agency** | BHP |
| **Emergency Contact**<br>**Refer APU Emergency Contact Directory (EMQnet)** | Integrity Management & Response (IMR) |
| **Activation Time** | Within 2 hours of BHP IC notifying Source Control Section Chief (SCSC) |
| **Implementation Plan / Guidance Document** | BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) |
| **Termination Criteria** | Well kill achieved and barriers reinstated |

**Supporting Information**

The BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) contains all required information and checklists for drilling a relief well and should be referred to in the first instance.

## Environmental Performance Standards

Table 6-6 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Relief Well Source Control response strategy.

**Table 6-6: Environmental performance – Source control: relief well**

| RS1.3 Source Control – Relief Well | | |
|---|---|---|
| **Environmental Performance Outcome** | **Discharge of hydrocarbons to the marine environment halted via well kill** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate relief well planning for a LOWC scenario not contained via subsea intervention within 2 hours of BHP IC notifying Source Control Section Chief (SCSC). | Incident log | IMT (IC) |
| BHP shall implement relief well operations in accordance with the BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025). | Incident log | SCSC |
| If mobilising an alternate MODU from within the region best endeavours will be made by BHP to kill the well via relief well drilling by day 49 following a LOWC event. | Incident log | SCSC |
| If mobilising an alternate MODU from within the region best endeavours will be made by BHP to well kill via relief well drilling by day 69 following a LOWC event. | Incident log | SCSC |
| Response shall only terminate when well kill has been achieved and barriers reinstated. | Incident log | IMT (IC) |

## 6.4 RS1.4 Source Control – Capping Stack

### Response Implementation

**Table 6-7: Response implementation – Source control: capping stack**

| RS1.4 Source Control – Capping Stack | |
|---|---|
| **Response Objective** | Halt the discharge of hydrocarbons to the marine environment |
| **Initiation Criteria** | LOWC (Level 3) |
| **Responsible** | BHP IMT (Source Control Section Chief) |
| **Controlling Agency** | BHP IMT |
| **Emergency Contact** | OSRL Singapore Duty Manager (24/7) |
| **Refer APU Emergency Contact Directory (EMQnet)** | Integrity Management & Response (IMR) |
| **Activation Time** | Within 2 hours of BHP IC notifying Source Control Section Chief (SCSC) |
| **Implementation Plan / Guidance Document** | BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) |
| **Termination Criteria** | Well kill achieved and barriers reinstated |

**Supporting Information**

The BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) contains all required information and checklists for the mobilisation and deployment of the Capping Stack System (CSS) and should be referred to in the first instance.

Implementation of Operational Monitoring, including subsea dispersant injection (SSDI) monitoring, is detailed within Part B of Appendix C – Operational and Scientific Monitoring Bridging Implementation Plan.

Refer Section 6.7 for Chemical Dispersant Application if initiating SSDI for volatile organic compound (VOC) reduction.

## Environmental Performance Standards

Table 6-8 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Capping Stack Source Control response strategy.

**Table 6-8: Environmental performance – Source control: capping stack**

| RS1.4 Source Control – Capping Stack | | |
|---|---|---|
| **Environmental Performance Outcome** | **Discharge of hydrocarbons to the marine environment halted via well capping** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate capping stack mobilisation for a LOWC scenario not contained via subsea intervention within 2 hours of BHP IC notifying Source Control Section Chief (SCSC). | Incident log | IMT (IC) |
| BHP shall implement the mobilisation and deployment of the OSRL CSS in accordance with the BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) | Incident log | SCSC |
| Best endeavours will be made by BHP to mobilise CSS to field (via OSRL) and implement capping stack deployment to contain well flow by day 16 following a LOWC event. | Incident log | SCSC |
| Response shall only terminate when well kill has been achieved and barriers reinstated. | Incident log | IMT (IC) |

## 6.5 RS1.5 Source Control – Subsea First Response Toolkit (SFRT)

### Response Implementation

**Table 6-9: Response implementation – Source control: SFRT**

| RS1.5 Source Control – SFRT | |
|---|---|
| **Response Objective** | Debris clearance to enable well containment |
| **Initiation Criteria** | LOWC (Level 3) Flowline release (Level 2) where debris clearance or SSDI may be required |
| **Responsible** | BHP IMT (Source Control Section Chief) |
| **Controlling Agency** | BHP |
| **Emergency Contact**<br>**Refer APU Emergency Contact Directory (EMQnet)** | OSRL Singapore Duty Manager (24/7): +65 6266 1566 |
| | AMOSC Duty Manager (24/7): 0438 379 328 |
| | Integrity Management & Response (IMR) |
| **Activation Time** | Within 2 hours of BHP IC notifying Source Control Section Chief (SCSC) |
| **Implementation Plan / Guidance Document** | BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) |
| **Termination Criteria** | Debris cleared |

**Supporting Information**

The BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) contains all required information and checklists for the mobilisation and deployment of the SRFT (from AMOSC) and the SIRT (from OSRL) and should be referred to in the first instance.

## Environmental Performance Standards

Table 6-10 provides the environmental performance outcomes, performance standards and measurement criteria for the Source Control response strategy.

**Table 6-10: Environmental performance – Source control: SFRT**

| RS1.5 Source Control – SFRT | | |
|---|---|---|
| **Environmental Performance Outcome** | **Reduce, control or halt the discharge of hydrocarbons in a timely manner by the implementation of source control methods.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate source control via SFRT and / or subsea incident response toolkip (SIRT) for a crude release from either a flowline rupture or a LOWC (where debris clearance or SSDI may be required) within 2 hours of BHP IC notifying Source Control Section Chief (SCSC). | Incident log | IMT (IC) |
| BHP shall implement the mobilisation and deployment of the AMOSC SFRT and/or OSRL SIRT in accordance with the BHP Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025). | Incident log | SCSC |
| Best endeavours will be made by BHP to mobilise SFRT to field (via AMOSC) to commence debris clearance (if required) by day 4 following a LOWC event. | Incident log | SCSC |
| Response shall only terminate once debris is cleared. | Incident log | IMT (IC) |

## 6.6 RS2 Monitor and Evaluate

### Response Implementation

**Table 6-11: Response implementation – Monitor and evaluate**

| RS2 Monitor and Evaluate | |
|---|---|
| **Response Objective** | Gain situational awareness to inform Operational SIMA & IAP |
| **Initiation Criteria** | Hydrocarbon spill (Level 2 / 3) |
| **Responsible** | IMT |
| **Controlling Agency** | BHP IMT (Commonwealth) WA DoT (State) |
| **Emergency Contact**<br>**Refer APU Emergency Contact Directory (EMQnet)** | AMOSC Duty Manager (24/7): 0438 379 328 |
| | RPS-Asia-Pacific Applied Science Associates (RPS-APASA) |
| | OSRL Singapore Duty Manager (24/7): +65 6266 1566 |
| | CHC Helicopters Operations, Karratha |
| | Mermaid Cove OSV |
| **Activation Time** | Within 2 hours of forming IMT |
| **Implementation Plan / Guidance Document** | Operational and Scientific Monitoring Bridging Implementation Plan (OSMBIP) (Appendix C)<br>APU Oil Spill Response Strategy – RS2 Monitor and Evaluate (AOHSE-ER-0053)<br>Operational Response Guideline 4: Oil Spill Tracking - Buoy Deployment/Tracking (AOHSE-ER-0033) |
| **Task-specific Termination Criteria** | Oil spill tracking buoy (OSTB) monitoring to continue for 24 hours after the spill source is under control and a surface sheen is no longer observable.<br>Visual observation will continue for 24 hours after the spill source is under control and a surface sheen is no longer observable.<br>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.<br>Satellite monitoring to continue until no further benefit is achieved from receiving satellite imagery. |

## First Strike Plan

***Aerial Surveillance***

**2 h**
- Notify CHC Helicopters and provide spill location, options also include mobilising from Karratha or Barrow Island.
- Inform shire / RAAF of additional aircraft movements.
- Mobilise personnel from FPSO for observations.

**8 h**
- Complete first aerial observation flights (daylight hours).
- Aerial surveillance observer logs to be submitted to IMT.

**16 h**
- Planning second flight based on trajectory modelling and spill tracking buoy locations.

**24 h**
- Establish long-term aerial observation plans with additional aircraft and trained observers from BHP, AMOSC or OSRL.

**>24 h**
- Complete daily safety analysis for the next 24 h period.
- Complete surveillance requirements as per IAP.

**Figure 6-4: First strike plan – Aerial surveillance**

### Supporting Information

BHP has a contract with CHC Helicopters, who provides crew change helicopters, 24/7 medevac and Search and Rescue (SAR) coverage. These helicopters can be used for aerial surveillance in a spill incident. Observers will be sourced from BHP, AMOSC and OSRL.

***Vessel Surveillance***

**2 h**
- Planning Section Chief request for fast response vessel or AHTS vessel in the area the need to mobilise for oil spill response.
- Advise surveillance of location of spill and any safety precautions.

**8 h**
- Spill location information and observations reported to IMT.

**16 h**
- Spill location information and observations reported to IMT.

**24 h**
- Continue to provide surveilance until directed by IMT.

**>24 h**
- Complete daily safety analysis for the next 24 h period.
- Complete surveillance requirements as per IAP.

**Figure 6-5: First strike plan – Vessel surveillance**

**Supporting Information**

Mermaid Cove OSV supporting operations will be location in-field or at Dampier Supply Base.

***Oil Spill Tracking Buoys***

**2 h**

- Deploy oil spill tracker buoys from MODU and FPSO.

**Figure 6-6: First strike plan – Oil spill tracking buoys**

**Supporting Information**

| Equipment Name | Self-Locating Datum Marker Buoy |
|---|---|
| **Location**** | Pyrenees FPSO and MODU |
| **Number** | 2 |
| **Response Time** | 2 ~ 5 h depending on the weather |
| **Deployment** | Side of a vessel / MODU (low point) |
| **Result Acquisition** | Globstar, near real time |
| **Operating Condition** | Beaufort 4-5 |
| **Operating Life** | 30/45 days |

*Oil spill modelling contractor may vary depending operational needs during a spill response.
** AMOSC has additional OSTB's in Exmouth and Geelong.

***Oil Spill Trajectory Modelling***

**2 h**

- Confirm deployment of oil spill tracker buoy.
- Planning Section Chief to contact AMOSC, activate OSTM standby contract.
- Planning Section Chief to obtain and communicate necessary modelling input data to AMOSC.

**8 h**

- Oil spill trajectory modelling report received.
- Provide trajectory model results to logistics for aerial surveillance planning.
- Identify AMBA and determine areas for 'post-spill / pre-impact' monitoring.
- Confirm hydrocarbon characteristics and confirm with AMOSC.

**16 h**

- Obtain spill tracker data.
- Correlate spill trajectory modelling with real time data from oil spill tracker buoy and communicate to AMOSC for update of trajectory modelling.
- Determine need and, if required, frequency of additional tracker buoy deployments.

**24 h**

- Obtain most recent spill trajectory modelling and communicate to logistics for planning.

**>24 h**

- Complete daily safety analysis for the next 24 h period.
- Complete modelling requirements as per IAP.

**Figure 6-7: First strike plan – Oil spill trajectory modelling**

**Supporting Information**

Contact AMOSC Duty Manager to initiate oil spill trajectory modelling. Contact: 0438 379 328.

| | |
|---|---|
| Data Needed for Initial Modelling | Hydrocarbon type, discharge rate / volume |
| | Discharge release point - coordinates and depth |
| | Wind conditions (strength and direction) |

***Satellite Imagery***

**2 h**

- Planning Section Chief request to OSRL for provision of satellite images.

**8 h**

- Planning Section Chief and Incident Commander to determine image acquisition frequency e.g. daily.

**16 h**

- Third-party satellite image provider to inform OSRL of the first available satellite image acquisition time and advise BHP IMT accordingly.

**24 h**

- OSRL / third party deliver satellite image.
- Satellite imagery showing oil spill trajectory used in development of the IAP to inform all response strategies, and used as an input to any OSTM.

**>24 h**

- Communicate satellite imagery requirements to OSRL for the next 24 h period.
- Complete surveillance requirements as per IAP.

**Figure 6-8: First strike plan – Satellite imagery**

**Supporting Information**

Contact OSRL Singapore Duty Manager (24/7): +65 6266 1566.

## Environmental Performance Standards

Table 6-12 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Monitor and Evaluate response strategy.

**Table 6-12: Environmental performance – Monitor and evaluate**

| RS2 Monitor and Evaluate | | |
|---|---|---|
| **Environmental Performance Outcome** | **Implementation of monitor and evaluate activities in order to provide situational awareness to inform IMT decision-making.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate monitoring and evaluation following a Level 2 or Level 3 hydrocarbon spill within 2 hours of forming IMT. | Incident log | IMT (IC) |
| BHP shall undertake all monitoring and evaluation tasks within the defined timeframes as per the monitoring and evaluation first strike plans. | Incident log / communication records | IMT (IC) |
| BHP shall terminate monitoring and evaluation in accordance with the task-specific termination criteria detailed within the response implementation (Table 6-11) of this OPEP. | Sign-off reports | IMT (IC) |

## 6.7 RS3 Chemical Dispersant Application

### Response Implementation

Table 6-13: Response implementation – Chemical dispersant application

| RS3 Chemical Dispersant Application | |
|---|---|
| **Response Objective** | Reduce surface hydrocarbon and shoreline loading, and / or reduce VOCs at surface to enable source control operations. |
| **Initiation Criteria** | Crude spill (Level 2 / 3) – pending Operational SIMA and approval (State) |
| **Responsible** | FWDA / SDA – IMT |
| | SSDI – IMT SCS (SIMOPS) |
| **Controlling Agency** | BHP IMT (Commonwealth) WA DoT (State) |
| **Emergency Contact**<br>**Refer APU Emergency Contact Directory (EMQnet)** | AMOSC Duty Manager (24/7): 0438 379 328 |
| | OSRL Singapore Duty Manager (24/7): +65 6266 1566 |
| | AMSA Environment Protection Response Duty Officer via AusSAR<br>Aviation<br>24-hour helpline<br>Within Australia: 1800 815 257<br>Outside Australia: +61 2 6230 6899 |
| | Integrity Management & Response (IMR) |
| **Activation Time** | Within 2 hours of forming IMT |
| **Implementation Plan / Guidance Document** | APU Oil Spill Response Strategy – RS3 Dispersant Includes Fixed Wing Aerial Dispersant (AOHSE-ER-0054).<br>Oil Spill Response Strategy – RS3 Marine Dispersant (AOHSE-ER-0055).<br>APU Procedure – Operational Response Guideline 2: Dispersant Strategies, Safety, Application, Resources and Effectiveness (AOHSE-ER-0042).<br>APU Oil Spill Dispersant Spray System (DSS) Application Procedure (AOHSE-ER-0047).<br>Oceaneering System Installation and Operation Manual: Subsea Dispersant System (970088281-DTS-SOM-001).<br>Australian Marine Oil Spill Centre (AMOSC). 2016. Subsea Dispersant Injection (SSDI) Guideline for Australia.<br>International Petroleum Industry Environmental Conservation Association - International Association of Oil & Gas Procedures. 2016a. Dispersants: subsea application. Report 533.<br>Industry Recommended Subsea Dispersant Monitoring Plan. API Technical Report 1152, Second Edition, November 2020.<br>BHP Source Control Emergency Response Plan (SCERP) – SFRT / SIRT. |

| | |
|---|---|
| | Register of oil spill control agents: https://www.amsa.gov.au/marine-environment/pollution-response/register-oil-spill-control-agents |
| **Termination Criteria** | Chemical dispersant not effective (as determined via efficacy testing results) or at the direction of Controlling Agency. |

## First Strike Plan

***Mobilise Dispersant***

**2 h**

- IMT to advise AMOSC of incident, request to mobilise dispersant stockpiles in Exmouth, Fremantle, Dampier and Geelong.
- Confirm with AMOSC labour at Learmonth for loading / unloading dispersant and planes.
- Mobilise dispersant Harold Holt to Learmonth airport or wharf via Exmouth Light Industrial.

**8 h**

- Arrange for AMOSC to develop logistics plan for supplies of dispersant for Days 2 to 5.
- Confirm with AMOSC pumping equipment for loading dispersent is mobilised.

**16 h**

- Arrange for AMOSC / OSRL to develop logistics plan for supplies of dispersant for Days 5 to 15.
- AMOSC to initiate arrangements for manufacture of dispersant.

**24 h**

- Arrange to receive international dispersant via OSRL.

**>24 h**

- Complete calculation of daily dispersant use.
- Advise OSRA's on rate of use of dispersant.
- Update IAP with availability of dispersant.
- OSRL to intiate GDS for maintaining dispersant supply as necessary.

**Figure 6-9: First strike plan – Dispersant mobilisation**

**Supporting Information**

Appendix B OPEP: Basis of Design and Field Capability Analysis includes information on dispersant stockpiles, mobilisation timeframes, OSCA Register, Operational SIMA for dispersant application and environmental impact and risk evaluation for chemical dispersant application.

***Engage Fixed Wing Dispersant Contract***

**2 h**

- Request AMOSC/AMSA to activate the Fixed Wind Aerial Dispersant Contract.
- Request Aerial Attack supervisor through AMSA/WA DOT.

**8 h**

- Develop Concept of Operations for AMSA approval.
- Arrange spotter aircraft for disperant application.
- Confirmation of fixed wing arrival at Learmonth.

**16 h**

- Arrange accomodation for pilots.
- Arrange aviation fuel.
- Consider mobilisaton of Hercules from OSRL - place on standby.

**24 h**

- Confirm requirement for additional dispersant aircraft.

**>24 h**

- Complete daily safety analysis and Operational SIMA for next 24 h period.
- Identify further additional requirements for dispersal aircraft.

**Figure 6-10: First strike plan – Activate fixed wing contract**

**Supporting Information**

AMSA, as Manager of Australia's NATPLAN, in conjunction with the Australian Institute of Petroleum (AIP), through AMOSC have put in place a Fixed Wing Aerial Dispersant Capability (FWADC) for the spraying of oil spill dispersant. This capacity is currently achieved by means of a contract with Aerotech 1st Response, based in Adelaide. BHP is a participant member of AMOSC, and therefore has access to this capability.

**Note:** Mobilisation of this service is through the AMSA Environment Protection Response Duty Officer via AusSAR. The AMOSC Duty Officer should also be notified to enable AMOSC to assist in smooth mobilisation.

***Aerial Application***

**4 h**

- Confirm mobilisation of the FWADC.

**8 h**

- Advise use of dispersent to AMSA and WA DoT.
- Undertake SIMA & develop IAP (in consultation with DoT if spraying in State jurisdiction).
- Permission from WA DoT required for any dispersant to be applied 'in or around' State waters.
- Permission required from DNP for any application in AMP and/or NWH Area.

**16 h**

- Load aircraft with dispersant and fuel.
- Brief pilots on spill SITREP, arrange dispersant plan.
- First flight completed.

**24 h**

- Report of dispersant effectiveness (via Aerial Surveillance).
- Develop flight plans for next operational period.

**>24 h**

- Continually assess efficacy of dispersant via aerial surveillance.
- Complete daily safety analysis and Operational SIMA for next 24 h period.
- Carry out dispersant application as per IAP.

**Figure 6-11: First strike plan – Aerial eispersant application**

**Supporting Information**

Procedure: Operational Response Guideline 2 - Dispersant Strategies. Safety, Application, Resources and Effectiveness (AOHSE-ER-0042).

***Vessel and Dispersant Spraying System (DSS)***

**2 h**

- Request BHP support vessel (Mermaid Cove) mobilise to Exmouth to collect spraying equipment and dispersant (or AHTS vessel under contract).
- Request AMOSC DSS / Prepare BHP DSS.

**8 h**

- Undertake SIMA & develop IAP (in consultation with WA DoT if spraying in State jurisdiction).
- Permission from DoT required for any dispersant to be applied 'in or around' State waters.
- Permission required from DNP for any application in Australian Marine Park and/or NWH Area.
- Arrange spotter aircraft for disperant application and shaker test equipment.
- Confirmation of vessel readiness.

**16 h**

- Carry out dispersant application as per IAP (pending Controlling Agency approval).
- Continually assess efficacy of dispersant via shaker test and aerial surveillance.

**24 h**

- Confirm requirement for additional dispersant vessels and DSS.

**>24 h**

- Complete daily safety analysis and Operational SIMA for next 24 h period.
- Identify further additional requirements for dispersal vessel.

**Figure 6-12: First strike plan – Vessel dispersant application**

**Supporting Information**

Procedures: Operational Response Guideline 2 - Dispersant Strategies. Safety, Application, Resources and Effectiveness (AOHSE-ER-0042);

APU Oil Spill Dispersant Spray System (DSS) Application Procedure (AOHSE-ER-0047); and

Oil Spill Response: Dispersant Application Field Guide.

BHP has two oil spill containers on the Pyrenees FPSO and in Exmouth (Exmouth Freight & Logistics). Each container contains Auspray boom and dispersant application system and $1 m^2$ of Corexit 9527 Dispersant.

AMOSC equipment consists of Viko spray units (4), Boom vane unit (1) and Afedo spray units (2). AMOSC also has heli buckets that BHP would NOT utilise.

AMSA has a number of dispersant spray systems at various Australian locations that can be identified through the NEMO portal:

https://amsa-forms.nogginoca.com/public/equipment.html?loc=%2Fapi%2Fv1%2Fasset%2F2616101.

OSRL have a variety of dispersant units that could be mobilised from Singapore (or other bases) if needed.

Mutual Aid. Through AMOSC there are a number of identified spray systems in the mutual aid register including Afedo units (5) and spray boom systems (6).

Contractors may be able to supply off the shelf dispersant equipment for sale or lease.

***Subsea Dispersant Injection (SSDI)***

**4 h**
- Request SFRT (including SSDI equipment + 250 $m^2$ dispersant) via AMOSC.
- Request SIRT (including subsea monitoring equipment) via OSRL (air).
- Request deployment of monitoring specialist via OSRL framework agreement.

**24 h**
- Undertake Operational SIMA & develop IAP.
- Arrange travel and accomodation for monitoring contractor (confirm COVID restrictions).
- Engage SFRT deployment vessel (min spec in BHP SCERP).

**48 h**
- Confirm mobilisation of SIRT (including monitoring equipment).
- Confirm mobilisation of monitoring contractor.
- Confirm receipt of SFRT (including SSDI equipment + 250 $m^2$ dispersant).

**6 d**
- Deploy SSDI equipment, monitoring equipment / personnel to field.
- Prepare to deploy equipment.

**8 d**
- Carry out dispersant application as per IAP.
- Complete daily safety analysis and Operational SIMA for next 24 h period
- Continually assess efficacy of dispersant via ROV surveillance / fluorometry / air quality

**Figure 6-13: First strike plan – Subsea dispersant injection (SSDI)**

**Supporting Information**

Procedures: BHP Australia Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025) provides further detail on SFRT deployment requirements.

Oceaneering System Installation and Operation Manual: Subsea Dispersant System (970088281-DTS-SOM-001).

Australian Marine Oil Spill Centre (AMOSC). 2016. Subsea Dispersant Injection (SSDI) Guideline for Australia.

International Petroleum Industry Environmental Conservation Association - International Association of Oil & Gas Procedures. 2016a. Dispersants: subsea application. Report 533.

Industry Recommended Subsea Dispersant Monitoring Plan. API Technical Report 1152, Second Edition, November 2020.

## Environmental Performance Standards

Table 6-14 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Dispersants response strategy.

**Table 6-14: Environmental performance – Chemical dispersant application**

| RS3 Chemical Dispersant Application | | |
|---|---|---|
| **Environmental Performance Outcome** | **Timely application of dispersant to effectively disperse hydrocarbons to reduce overall shoreline accumulation; and/or chemical dispersant application enables the safe deployment of response equipment and personnel.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate chemical dispersant mobilisation following a Level 2 or Level 3 crude spill within 2 hours of forming IMT. | Incident log | IMT (IC) |
| BHP shall undertake all chemical dispersant application tasks within the defined timeframes as per the chemical dispersant application first strike plans and with the approval of the Controlling Agency. | Incident log / communication records | IMT (IC) |
| BHP shall only apply chemical dispersants within a 50 km radius around the Pyrenees Facility, in water depths greater than 50m. | Incident log / communication records | IMT (IC) |
| BHP shall not apply chemical dispersants within an Australian Marine Park without prior approval from the Director of National Parks (DNP) nor within the Ningaloo Coast World Heritage Area without prior approval from the DBCA and DNP. | Incident log / communication records | IMT (IC) |
| BHP shall only apply chemical dispersants on the OSCA Register or transitional list. | Incident log | IMT (IC) |
| BHP shall monitor and record the types, volumes and areas of application of chemical dispersants. | Incident log | IMT (IC) |
| If EPBC Act-listed migratory species such as humpback whales or whale sharks are observed in the immediate vicinity of dispersant operations, application will cease until the animal has not been sighted for a period of 30 minutes. | Incident log | IMT (IC) |
| BHP shall terminate chemical dispersant application where efficacy test results indicate dispersant not effective or at the direction of Controlling Agency. | Sign-off reports | IMT (IC) |

## 6.8 RS4 Marine Recovery

### Response Implementation

**Table 6-15: Response implementation – Marine recovery**

| RS4 Marine Recovery | |
|---|---|
| **Response Objective** | Reduce surface (floating) hydrocarbons and reduce hydrocarbon loading on shorelines. |
| **Initiation Criteria** | Crude spill (Level 2 / 3) |
| **Responsible** | BHP IMT |
| **Controlling Agency** | BHP IMT (Commonwealth) WA DoT (State) |
| **Emergency Contact** | AMOSC Duty Manager (24/7): 0438 379 328 |
| **Activation Time** | <2 hours after notification from BHP IMT |
| **Implementation Plan / Guidance Document** | APU Oil Spill Response Strategy – RS4 Marine Recovery (AOHSE-ER-0056).<br>Containment and Recovery Field Guide (Oil Spill Response, 2011).<br>Standard Operating Procedure: Booms – Offshore RO-BOOM / Lamor HD boom (AMOSC, 2014). |
| **Termination Criteria** | Monitoring observations indicate surface oil slick has been removed to extent that continuation of the operations is no longer considered to be effective and / or surface oil slick is no longer deemed a potential threat to sensitive environmental receptors and in agreement with the Jurisdictional Authority. |

## First Strike Plan

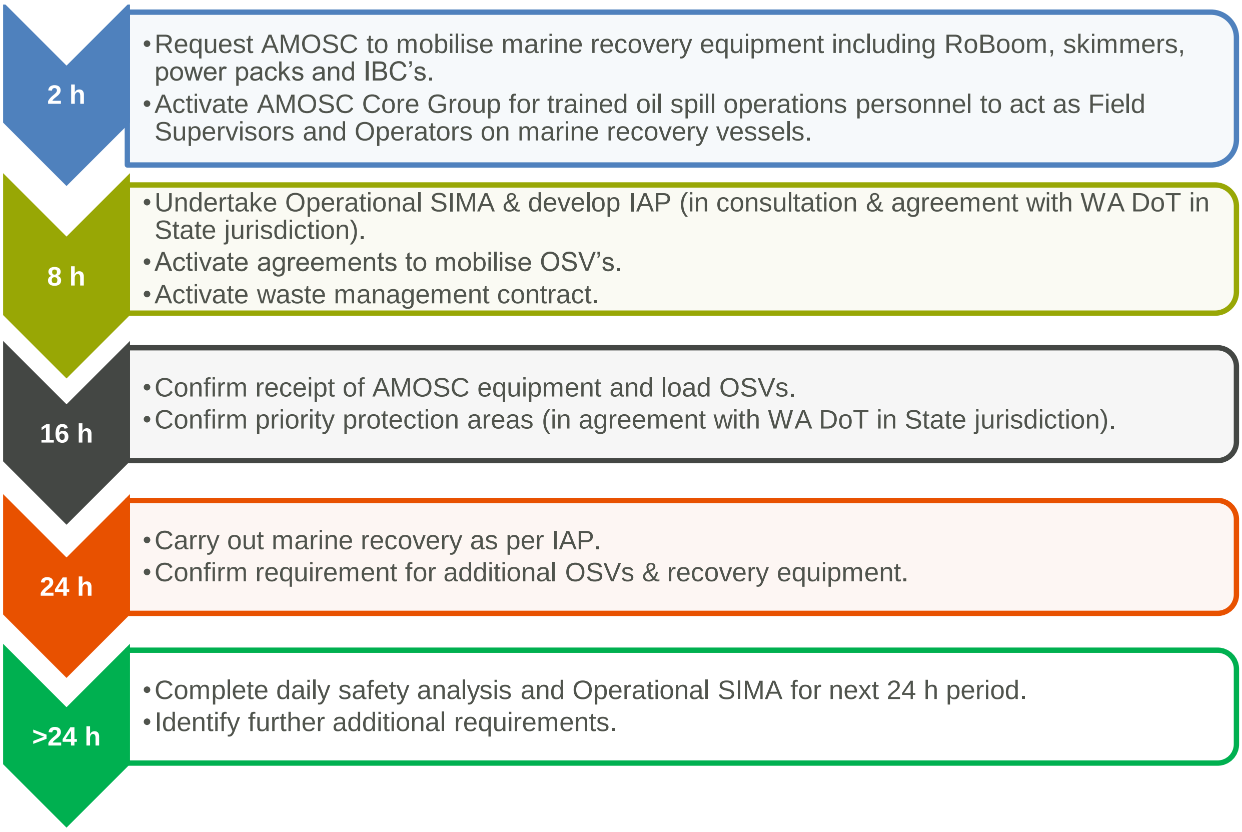



**Figure 6-14: First strike plan – Marine recovery**

## Environmental Performance Standards

Table 6-16 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Marine Recovery response strategy.

**Table 6-16: Environmental performance – Marine recovery**

| RS4 Marine Recovery | | |
|---|---|---|
| **Environmental Performance Outcome** | **Timely implementation of marine recovery to reduce overall shoreline accumulation.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate marine recovery within 2 hours of forming IMT following a Level 2 or Level 3 crude spill. | Incident log | IMT (IC) |
| BHP shall undertake all marine recovery tasks within the defined timeframes as per the marine recovery first strike plan. | Incident log / communication records | IMT (IC) / JSCC |
| Crude oil waste retrieved shall be managed in accordance with the APU Waste Management Plan – Oil Spill (AOHSE-E-0014-001). | Waste records/ manifests. | IMT (IC) |
| If EPBC Act-listed migratory species such as humpback whales or whale sharks are observed in the immediate vicinity of marine recovery operations, operations will cease until the animal has not been sighted for a period of 30 minutes. | Incident log | FRT |
| BHP shall terminate marine recovery in accordance with the termination criteria detailed within the response implementation (Table 6-16) of this OPEP. | Sign-off reports | IMT (IC) |

## 6.9 RS5 Shoreline Protection

### Response Implementation

**Table 6-17: Response implementation – Shoreline protection**

| RS5 Shoreline Protection | |
|---|---|
| **Response Objective** | Protection of priority shorelines from contact from surface (floating) hydrocarbons and reduced hydrocarbon loading on shorelines. |
| **Initiation Criteria** | Hydrocarbon spill (Level 2 / 3) |
| **Responsible** | DoT IMT / Joint Strategic Coordination Committee (JSCC) |
| **Controlling Agency** | WA DoT (State) |
| **Emergency Contact** | AMOSC Duty Manager (24/7): 0438 379 328 |
| **Activation Time** | <2 hours after notification from BHP IMT with first-strike deployment |
| **Implementation Plan / Guidance Document** | BHP Oil Spill Response Strategy – RS5 Shoreline Protection (AOHSE-ER-0057).<br>Tactical Response Plans (TRPs):<br>• Yardie Creek (AOHSE-ER-0068)<br>• Turquoise Bay (AOHSE-ER-0067)<br>• Mangrove Bay (AOHSE-ER-0065)<br>• Jurabi Point to Lighthouse beaches (AOHSE-ER-0064)<br>• Muiron Islands (AOHSE-ER-0066)<br>North West Cape Sensitivity Mapping (AOHSE-ER-0036). |
| **Termination Criteria** | Outcomes of the operational SIMA determine that shoreline protection is no longer effective at protecting sensitive resources and in agreement with the Jurisdictional Authority. |

## First Strike Plan

**2 h**

- Request AMOSC to mobilise shoreline protection equipment to Harold Holt base.
- Activate AMOSC Core Group for trained oil spill operations personnel to act as Field Supervisors and Operators.

**8 h**

- Undertake Operational SIMA & develop IAP (in consultation & agreement with WA DoT).
- Identify protection priorities in agreement with WA DoT (based upon RS2 monitoring results).
- Engage labour-hire contract (200+ workforce).

**16 h**

- Confirm receipt of AMOSC equipment.
- Confirm priority protection areas (in agreement with WA DoT).
- Arrange logistics / accomodation for response personnel.

**24 - 96 h**

- Confirm logistics / accomodation for first-strike (Core Group) response personnel.
- Mobilise boom equipment from Harold Holt base to protection priority locations.
- Initiate shoreline protection as per IAP.
- Complete daily safety analysis and Operational SIMA for the next 24 h.
- Assess efficiency of booming and build response actions into IAP.
- Identify further additional requirements e.g. logistics / personnel / accomodation / equipment.

**>96 h**

- Provide induction for labour-hire personnel.
- Mobilise additional labou-hire personnel / equipment to priority protection areas.
- Complete daily safety analysis and Operational SIMA for the next 24 h.
- Assess efficiency of booming and build response actions into IAP.
- Continue as directed by WA DoT.

**Figure 6-15: First strike plan – Shoreline protection**

**Supporting Information**

Refer to document North West Cape Sensitivity Mapping (AOHSE-ER-0036) and Tactical Response Plans.

Mobilise AMOSC shoreline response team to coordinate delivery of shoreline response equipment from Harold Holt.

## Environmental Performance Standards

Table 6-18 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Shoreline Protection response strategy.

**Table 6-18: Environmental performance – Shoreline protection**

| RS5 Shoreline Protection | | |
|---|---|---|
| **Environmental Performance Outcome** | **Timely implementation of shoreline protection to reduce overall shoreline accumulation.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate shoreline protection within 2 hours of forming IMT following a Level 2 or Level 3 hydrocarbon spill and at the direction of the Controlling Agency. | Incident log | IMT (IC) |
| BHP shall undertake all shoreline protection tasks within the defined timeframes as per the shoreline protection first strike plan. | Incident log / communication records | IMT (IC) / JSCC |
| At a minimum, shoreline response IAPs shall consider:<br>• Responder HSE requirements;<br>• Suitability of shoreline response strategies in relation to coastal features and potential environmental risks;<br>• Management of personnel and equipment on turtle nesting beaches;<br>• Potential impacts from night time operations (light spill / glow) on listed species;<br>• Potential disturbance to intertidal habitats from response operations;<br>• Potential for introduction and establishment of invasive species | IAP | IMT (IC) / JSCC |
| BHP shall undertake shoreline protection as directed by WA DoT. | Incident log / communication records | BHP IMT (IC) |
| Response personnel induction shall include:<br>• Activity-specific controls;<br>• Overview of EPBC listed / threatened / migratory species and fauna handling requirements and reporting protocols;<br>• Hazards to shoreline environments due to response operations;<br>• Hazards associated with artificial lighting and overview of National Light Pollution Guidelines (DoEE, 2020) and light reduction measures for night time operations;<br>• Oil contaminated waste containment and equipment cleaning measures; and<br>• Hazards associated with the introduction of invasive species to offshore island habitats. | Training records. | BHP |

| RS5 Shoreline Protection | | |
|---|---|---|
| **Environmental Performance Outcome** | **Timely implementation of shoreline protection to reduce overall shoreline accumulation.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| Project induction for Vessel Masters shall include:<br>• EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans (modified to include whale sharks and turtles);<br>• Hazards to nearshore benthic environments due to mooring activities;<br>• Hazards associated with artificial lighting and overview of National Light Pollution Guidelines (DoEE, 2020) and light reduction measures for night time operations;<br>• Speed limitations in nearshore environments to reduce engine noise;<br>• Overview of Marine Order 91 (Pollution Prevention – Oil), Marine Order 94 (Pollution Prevention – Packaged Harmful Substances), Marine Order 95 (Pollution Prevention – Garbage) and Marine Order 96 (Pollution Prevention – Sewage);<br>• Waste containment measures for small vessels and onshore waste disposal options;<br>• An overview of Australian Ballast Water Management Requirements (Rev 8); and<br>• Hazards associated with the introduction of invasive species to offshore island habitats. | Training records | BHP |
| Shoreline protection equipment including boats shall be selected that are fit for purpose (i.e., shallow-bottom) and no anchoring of vessels or booms will occur on emergent reefs or other fragile/ sensitive benthic habitats. | Contracts for use of shoreline protection equipment with OSRAs. | BHP |
| BHP shall provide demarcation of identified values and sensitivities to mitigate potential impacts from response personnel and equipment. | Incident log | BHP |
| Shoreline protection operations shall avoid cultural heritage sensitivities, or where entry is required shall be done in consultation with, and approval of, the WA Department of Planning, Lands and Heritage prior to entry. | Records of IAPs and field reports include review and management of heritage values. | IMT (IC) / JSCC |
| BHP shall facilitate visual inspections for exotic terrestrial species (pests) of vessels, helicopters, equipment, and personnel mobilising to offshore islands as part of any shoreline response activity. | Inspection records | BHP |
| All response vessels shall be subject to BHP Introduced Marine Species Risk Assessment and Approval Procedure (AOHSE-E-0018-001). | Assessment records | BHP |

| RS5 Shoreline Protection | | |
|---|---|---|
| **Environmental Performance Outcome** | **Timely implementation of shoreline protection to reduce overall shoreline accumulation.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall terminate shoreline protection when the outcomes of the Operational SIMA determine that shoreline protection is no longer effective at protecting sensitive resources as agreed with the Jurisdictional Authority. | Sign-off report | IMT (IC) / JSCC |

## 6.10 RS8 Shoreline Clean-Up

### Response Implementation

**Table 6-19: Response implementation – Shoreline clean-up**

| RS8 Shoreline Clean-up | |
|---|---|
| **Response Objective** | Shoreline clean-up of hydrocarbons |
| **Initiation Criteria** | Hydrocarbon spill (Level 2 / 3) |
| **Responsible** | DoT IMT / Joint Strategic Coordination Committee (JSCC) |
| **Controlling Agency** | WA DoT (State) |
| **Emergency Contact** | AMOSC Duty Manager (24/7): 0438 379 328 |
| **Activation Time** | <2 hours after notification from BHP IMT. |
| **Implementation Plan / Guidance Document** | BHP Oil Spill Response Strategy – RS8 Shoreline Clean-up (AOHSE-ER-0058)<br>Tactical Response Plans (TRPs):<br>• Yardie Creek (AOHSE-ER-0068)<br>• Turquoise Bay (AOHSE-ER-0067)<br>• Mangrove Bay (AOHSE-ER-0065)<br>• Jurabi Point to Lighthouse beaches (AOHSE-ER-0064)<br>• Muiron Islands (AOHSE-ER-0066)<br>North West Cape Sensitivity Mapping (AOHSE-ER-0036)<br>WA DoT Shoreline Assessment Form (A8525747)<br>OSR Shoreline Operations Field Guide: A guide to operational and monitoring requirements for shoreline clean-up operations (2011)<br>POSOW Oiled Shoreline Assessment Manual: https://www.posow.org/documentation/assessmentmanual.pdf<br>POSOW Oiled Shoreline Clean-up Manual: https://www.posow.org/documentation/cleanupmanual.pdf |
| **Termination Criteria** | When acceptable levels of cleanliness (endpoint criteria) have been met and signed off consistent with National Plan Response, Assessment and Termination of Cleaning for Oil Contaminated Foreshores (NP-GUI-025) (2015). |

## First Strike Plan

**2 h**

- Request AMOSC to mobilise shoreline clean-up equipment to Harold Holt base.
- Activate AMOSC Core Group for trained oil spill operations personnel to act as Field Supervisors (SCAT & clean-up) and Operators.

**8 h**

- Undertake Operational SIMA & develop IAP (in consultation & agreement with WA DoT).
- Identify protection priorities in agreement with WA DoT (based upon RS2 monitoring results).
- Engage labour-hire contract (200+ workforce).

**16 h**

- Confirm receipt of AMOSC equipment.
- Confirm a minimum of 5x shoreline clean-up kits comparable to WA DoT clean-up response kit mobilised - mobilise additional equipment if required.
- Confirm priority protection areas (in agreement with WA DoT).
- Arrange logistics / accomodation for response personnel.

**24 - 96 h**

- Confirm logistics / accomodation for first-strike (Core Group) response personnel.
- Mobilise equipment from Harold Holt base to protection priority locations.
- Initiate shoreline clean-up as per IAP.
- Complete daily safety analysis and Operational SIMA for the next 24 h.
- Assess efficiency of booming and build response actions into IAP.
- Identify further additional requirements e.g. logistics / personnel / accomodation / equipment.

**>96 h**

- Provide induction for labour-hire personnel.
- Mobilise additional labour-hire personnel / equipment to priority protection areas.
- Complete daily safety analysis and Operational SIMA for the next 24 h.
- Assess efficiency of booming and build response actions into IAP.
- Continue as directed by WA DoT until endpoint criteria met.

**Figure 6-16: First strike plan – Shoreline clean-up**

## Environmental Performance Standards

Table 6-20 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Shoreline Clean-up response strategy.

**Table 6-20: Environmental performance – Shoreline clean-up**

| RS8 Shoreline Clean-up | | |
|---|---|---|
| **Environmental Performance Outcome** | **Timely implementation of shoreline clean-up to remove stranded hydrocarbons to accelerate habitat recovery.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate shoreline cleanup within 2 hours of forming IMT following a Level 2 or Level 3 hydrocarbon spill and at the direction of the Controlling Agency | Incident log | IMT (IC) |
| BHP shall undertake all shoreline clean-up tasks within the defined timeframes as per the shoreline clean-up first strike plan | Incident log / communication records | IMT (IC) / JSCC |
| At a minimum, shoreline response IAPs shall consider:<br>• Responder HSE requirements;<br>• Suitability of shoreline response strategies in relation to coastal features and potential environmental risks;<br>• Management of personnel and equipment on turtle nesting beaches;<br>• Potential impacts from night time operations (light spill / glow) on listed species;<br>• Potential disturbance to intertidal habitats from response operations;<br>• Potential for introduction and establishment of invasive species | IAP | IMT (IC) / JSCC |
| BHP shall undertake shoreline clean-up as directed by WA DoT. | Incident log / communication records | BHP IMT (IC) |
| Response personnel induction shall include:<br>• Activity-specific controls;<br>• Overview of EPBC listed / threatened / migratory species and fauna handling requirements and reporting protocols;<br>• Hazards to shoreline environments due to response operations;<br>• Hazards associated with artificial lighting and overview of National Light Pollution Guidelines (DoEE, 2020) and light reduction measures for night time operations;<br>• Oil contaminated waste containment and equipment cleaning measures; and<br>• Hazards associated with the introduction of invasive species to offshore island habitats. | Training records. | BHP |

| RS8 Shoreline Clean-up | | |
|---|---|---|
| **Environmental Performance Outcome** | **Timely implementation of shoreline clean-up to remove stranded hydrocarbons to accelerate habitat recovery.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| The type and size of shoreline clean-up equipment shall be appropriate for the nature and scale of response operation and objective of IAP. | Incident log | BHP |
| BHP shall provide demarcation of identified values and sensitivities to mitigate potential impacts from response personnel and equipment. | Incident log | BHP |
| Shoreline clean-up operations shall avoid cultural heritage sensitivities, or where entry is required shall be done in consultation with, and approval of, the WA Department of Planning, Lands and Heritage prior to entry. | Records of IAPs and field reports include review and management of heritage values. | IMT (IC) / JSCC |
| BHP shall facilitate visual inspections for exotic terrestrial species (pests) of vessels, helicopters, equipment, and personnel mobilising to offshore islands as part of any shoreline response activity. | Inspection records | BHP |
| BHP shall terminate shoreline clean-up when acceptable levels of cleanliness (endpoint criteria) have been met and signed off consistent with National Plan Response, Assessment and Termination of Cleaning for Oil Contaminated Foreshores (NP-GUI-025) (2015). | Sign-off report | IMT (IC) / JSCC |

## 6.11 RS10 Environmental Monitoring

### Response Implementation

Table 6-21: Response implementation – Environmental monitoring

| RS10 Environmental Monitoring | |
|---|---|
| **Response Objective** | Identify areas potentially exposed to hydrocarbon, assess the effects of hydrocarbon exposure and monitor post-spill recovery of sensitive environmental receptors. |
| **Initiation Criteria** | Hydrocarbon spill (Level 2 / 3) |
| **Responsible** | BHP IMT |
| **Controlling Agency** | BHP IMT (Commonwealth) WA DoT (State) |
| **Emergency Contact Refer APU Emergency Contact Directory (EMQnet)** | OSM Service Providers |
| **Activation Time** | <8 hours after notification from BHP IMT |
| **Implementation Plan / Guidance Document** | Pyrenees Field: Operational and Scientific Monitoring Bridging Implementation Plan (OSMBIP) (Appendix C).<br>APU Oil Spill Response Strategy – RS10 Environmental Monitoring (AOHSE-ER-0060). |
| **Program-Specific Termination Criteria** | Environmental Monitoring – Water Quality, Sediment Quality and Benthic Infauna:<br>• Oil concentrations in marine waters must not exceed normal background concentrations; and (if activated)<br>• No statistical difference in hydrocarbon concentrations in sediments between impact and reference locations; and (if activated).<br>• No statistical difference in benthic infauna abundance and diversity between impact and reference locations;<br>• Deemed unsafe to continue implementing RS10 activities; and<br>• Agreement is reached with the Jurisdictional Authority.<br>Environmental Monitoring – Benthic Habitats and Benthic Primary Producers:<br>• Oil concentrations in marine waters must not exceed normal background concentrations; and<br>• No statistical difference in species diversity, abundance, distribution and percentage cover of benthic habitats (e.g. corals, macroalgae and seagrasses) between impact and reference locations; and (if activated)<br>• No statistical difference in mangrove bioindicators (e.g. faunal burrows, pneumatophore counts, leaf health status) between impact and reference locations;<br>• Deemed unsafe to continue implementing RS10 activities; and<br>• Agreement is reached with the Jurisdictional Authority.<br>Environmental Monitoring – Seabirds and Migratory Shorebirds:<br>• Oil concentrations in marine waters must not exceed normal background concentrations; and<br>• No statistical difference in oiled seabird or migratory shorebird abundance and diversity between impact and reference locations.<br>• Deemed unsafe to continue implementing RS10 activities; and |

| | |
|---|---|
| | • Agreement is reached with the Jurisdictional Authority.<br>Environmental Monitoring – Marine Mammals and Megafauna:<br>• Oil concentrations in marine waters must not exceed normal background concentrations;<br>• No statistical difference in marine mammal, whale shark abundance between impact and reference locations.<br>• Deemed unsafe to continue implementing RS10 activities; and<br>• Agreement is reached with the Jurisdictional Authority.<br>Environmental Monitoring – Marine Reptiles:<br>• Oil concentrations in marine waters must not exceed normal background concentrations; and<br>• No statistical difference in turtle nesting abundance and spatial distribution, population dynamics and turtle morphology between impact and reference locations.<br>• Deemed unsafe to continue implementing RS10 activities; and<br>• Agreement is reached with the Jurisdictional Authority.<br>Environmental Monitoring – Commercial and Recreational Fish Species:<br>• Oil concentrations in marine waters must not exceed normal background concentrations; and<br>• Hydrocarbon levels in representative commercial and recreational fish species tissue meet statutory specification for food products as per Yender et al. (2002);<br>• No statistical difference in hydrocarbon levels in representative commercial and recreational fish species tissue between impact and reference locations;<br>• DPIRD is satisfied that levels of hydrocarbons in targeted fish species are no longer related to the oil spill event.<br>• Deemed unsafe to continue implementing RS10 activities; and<br>• Agreement is reached with the Jurisdictional Authority.<br>Environmental Monitoring – Effects of an Oil Spill on Fishes:<br>• Oil concentrations in marine waters must not exceed normal background concentrations; and<br>• No statistical difference in species diversity and abundance, of mobile and site-attached fishes between impact and reference locations; and<br>• DPIRD is satisfied that the patterns of species diversity and abundance of fishes associated with coral reefs, seagrasses, mangroves, macroalgal beds and deep-water sponge gardens (to a depth of 100 m) are no longer related to the oil spill event.<br>• Deemed unsafe to continue implementing RS10 activities; and<br>• Agreement is reached with the Jurisdictional Authority. |

## OSM Activation Process

| Responsibility | Task | Timeframe |
|---|---|---|
| **Environment Unit Leader (BHP)** | Review initiation criteria of OMPs and SMPs during the preparation of the initial Incident Action Plan (IAPs) and subsequent IAPs; and if any criteria are met, activate relevant OMPs and SMPs. | Within 4 hours of spill notification |
| | Obtain approval from Incident Commander Leader to initiate OSM. | Within 4 hours of spill notification |
| | Contact OSM Services Provider and notify on-call officer of incident, requesting provision of OSM Implementation Lead to the IMT. | Within 4 hours of spill notification |
| | Provide monitor and evaluate data (e.g. aerial surveillance, fate and weathering modelling, tracking buoy data) to OSM Services Provider. | Within 1 hour of data being received by IMT |
| | Liaise directly with OSM Services Provider to confirm which OMPs and SMPs are to be fully activated. | Within 3 hours of monitor and evaluate data being received from IMT |
| | Provide purchase order to OSM Services Provider (cross reference OSM Standby Services Scope of Work). | Within 72 hours of initial notification to OSM Services Provider |
| | Record tasks in Personal Log. | At time of completion of task |
| **OSM Service Provider** | On-call officer to notify Service Provider Manager of activation and contact OSM Implementation Lead and Scientific Logistics Coordinator. | Within 8 hours of notification being made to OSM Services Provider |
| | Send OSM Implementation Lead and Scientific Logistics Coordinator to IMT. | Within 12 hours of notification being made to OSM Services Provider |
| | Liaise directly with EUL to confirm which OMPs and SMPs are to be fully activated. | Within 4 hours of monitor and evaluate data being received from IMT |
| | Confirm availability of initial personnel and equipment resources. | Within 5 hours of monitor and evaluate data being received from IMT |

**Supporting Information**

Implementation of Environmental (Scientific) Monitoring is detailed within Part B of the Pyrenees Field: Operational and Scientific Monitoring Bridging Implementation Plan (OSMBIP) (Appendix C).

The sampling procedures to assess water and sediment quality, benthic habitats and marine wildlife are described in following BHP Environmental Monitoring Procedures:

- Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)
- Monitoring Effects of an Oil Spill on Birds (AOHSE-ER-0038)

- Monitoring Effects of an Oil Spill on Marine Mammals and Megafauna (AOHSE-ER-0039)
- Monitoring Effects of an Oil Spill on Benthic Habitats and Benthic Primary Producers (AOHSE-ER-0040)
- Monitoring Effects of an Oil Spill on Marine Reptiles (AOHSE-ER-0043)
- Monitoring Effects of an Oil Spill on Commercial and Recreational Fish Species (AOHSE-ER-0048)
- Monitoring Effects of an Oil Spill on Fishes (AOHSE-ER-0051).

## Environmental Performance Standards

Table 6-22 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Environmental Monitoring response strategy.

**Table 6-22: Environmental performance – Environmental monitoring**

| RS10 Environmental Monitoring | | |
|---|---|---|
| **Environmental Performance Outcome** | **Implement environment monitoring programs in a timely manner to identify areas potentially exposed to hydrocarbon, assess the effects of hydrocarbon exposure and monitor post-spill recovery of sensitive environmental receptors.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate environmental monitoring following a Level 2 or Level 3 hydrocarbon spill | Incident log | IMT (IC) |
| BHP shall initiate environmental (scientific) monitoring within the timeframes detailed within the OSM Activation Process. | Incident log / communication records | Environment Unit Leader<br>(BHP) |
| BHP shall implement environmental (scientific) monitoring as per Part B of the Pyrenees Field: Operational and Scientific Monitoring Bridging Implementation Plan (OSMBIP) (Appendix C). | Incident log | IMT (IC) |
| Environmental monitoring personnel shall be appropriately trained to undertake monitoring operations as per Section 9.1 of the the Pyrenees Field: Operational and Scientific Monitoring Bridging Implementation Plan (OSMBIP) (Appendix C). | Training records | GHD Pty Ltd |
| Environmental monitoring operations shall avoid cultural heritage sensitivities, or where entry is required shall be done in consultation with, and approval of, the WA Department of Planning, Lands and Heritage prior to entry. | Records of IAPs and field reports include review and management of heritage values. | IMT (IC) |
| BHP shall terminate environmental monitoring in accordance with the program-specific termination criteria detailed within the response implementation (Table 6-21) of this OPEP. | Sign-off reports | IMT (IC) |

## 6.12 RS11 Oiled Wildlife Response

### Response Implementation

Table 6-23: Response implementation – Oiled wildlife response

| RS11 Oiled Wildlife | |
|---|---|
| **Response Objective** | Protect exposed wildlife by removal and relocation, or treatment and release, during a spill event. |
| **Initiation Criteria** | Hydrocarbon spill (Level 2 / 3) |
| **Responsible** | IMT (IC) / JSCC |
| **Controlling Agency** | BHP (Commonwealth) WA DoT (State) |
| **Emergency Contact** | AMOSC Duty Manager (24/7): 0438 379 328 |
| **Activation Time** | Within 2 hours after forming IMT |
| **Implementation Plan / Guidance Document** | BHP Oil Spill Response Strategy – RS11 Oiled Wildlife Response (AOHSE-ER-0061).<br>Western Australia Oiled Wildlife Response Plan (WAOWRP).<br>The Pilbara Region Oil Spill Wildlife Response Plan (PROSWRP). |
| **Termination Criteria** | As per Section 4.8 of the Western Australia Oiled Wildlife Response Plan (WAOWRP) and in agreement with the Jurisdictional Authority (DBCA in State & DAWE in Commonwealth). |

## First Strike Plan

**2 h**

- Request AMOSC to mobilise wildlife recovery & cleaning equipment to Harold Holt base.
- Activate AMOSC Core Group for trained oiled wildlife responders.
- Advise WA DoT/DBCA/DAWE oiled wildlife response is necessary, and provide ETA of equipment and personnel.

**8 h**

- Undertake SIMA & develop IAP (in consultation & agreement with WA DoT/DBCA).
- Identify protection priorities in agreement with WA DoT/DBCA (based upon RS2 monitoring results).
- Engage Veterinarians in consultation with DBCA.

**16 h**

- Confirm receipt of AMOSC equipment.
- Confirm priority protection areas (in agreement with WA DoT / DBCA).
- Arrange logistics / accomodation for response personnel.

**24 - 96 h**

- Confirm logistics / accomodation for first-strike response personnel.
- Establish field oiled wildlife facilities at protection priority locations.
- Initiate early triage and field processing under direction of DBCA.
- Complete daily safety analysis and Operational SIMA for the next 24 h.
- Select primary care facility location in consultation with WA DoT / DBCA.

**>96 h**

- Establish primary care facility and support services in consultation with WA DoT / DBCA.
- Complete daily safety analysis and Operational SIMA for the next 24 h.
- Continue as directed by DBCA / DAWE until end-point criteria met.

**Figure 6-17: First strike plan – Oiled wildlife response**

## Environmental Performance Standards

Table 6-24 provides the environmental performance outcomes, performance standards and measurement criterial for the implementation of Oiled Wildlife Response strategy.

**Table 6-24: Environmental performance – Oiled wildlife response**

| RS11 Oiled Wildlife Response (OWR) | | |
|---|---|---|
| **Environmental Performance Outcome** | **Implement oiled wildlife response in accordance with the Western Australian Oiled Wildlife Response Plan (WAOWRP) and Pilbara Region Oiled Wildlife Response Plan (PROWRP) to protect exposed wildlife by removal and relocation, or treatment and release, during a spill event.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate oiled wildlife response following a Level 2 or Level 3 hydrocarbon spill and at the direction of the Jurisdictional Authority. | Incident log | IMT (IC) |
| BHP shall undertake all oiled wildlife response tasks within the defined timeframes as per the oiled wildlife response first strike plan | Incident log / communication records | IMT (IC) / JSCC |
| BHP shall undertake oiled wildlife response within State jurisdiction under the direction of DBCA and in a manner consistent with the Western Australian Oiled Wildlife Response Plan (WAOWRP) and Pilbara Region Oiled Wildlife Response Plan (PROWRP). | Incident log / communication records | IMT (IC) / JSCC |
| BHP shall undertake oiled wildlife response within Commonwealth jurisdiction under the direction of DAWE and in consultation with DBCA in a manner consistent with the Western Australian Oiled Wildlife Response Plan (WAOWRP) and Pilbara Region Oiled Wildlife Response Plan (PROWRP). | Incident log / communication records | IMT (IC) / JSCC |
| Lead oiled wildlife response personnel shall be trained to the satisfaction of DBCA and experienced for the activities to which they are assigned. | Training records | IMT (IC) / JSCC |
| Support oiled wildlife response personnel shall be trained to the satisfaction of DBCA prior to undertaking oiled wildlife response operations. | Training records | IMT (IC) / JSCC |
| Oiled wildlife response operations shall avoid cultural heritage sensitivities, or where entry is required shall be done in consultation with, and approval of, the WA Department of Planning, Lands and Heritage prior to entry. | Records of IAPs and field reports include review and management of heritage values | IMT (IC) / JSCC |
| BHP shall terminate oiled wildlife response when end-point criteria have been met as per Section 4.8 of the Western Australia Oiled Wildlife Response Plan (WAOWRP) and in agreement with the Jurisdictional Authority (DBCA in State & DAWE in Commonwealth). | Sign-off report | IMT (IC) / JSCC |

## 6.13 RS12 Forward Operating Base

### Response Implementation

**Table 6-25: Response implementation – Forward operating base**

| RS12 Forward Operating Base | |
|---|---|
| **Response Objective** | Establish a forward command post with BHP IMT personnel and communications support to enable effective coordination of on-ground resources during an oil spill response. |
| **Initiation Criteria** | Hydrocarbon spill (Level 2 / 3) |
| **Responsible** | BHP IMT (IC) |
| **Controlling Agency** | BHP IMT |
| **Emergency Contact**<br>**Refer APU Emergency Contact Directory (EMQnet)** | Harold E Holt Naval Base (see Supporting Information below) |
| **Activation Time** | <2 hours after notification from BHP IMT. |
| **Implementation Plan / Guidance Document** | APU Oil Spill Response Strategy – RS12 Forward Operating Base (AOHSE-ER-0062) |
| **Termination Criteria** | End of response |

### First Strike Plan

**2 h**
- Inform Department of Defence & Exmouth Shire Forward Operating Base (FOB) to be set up.
- Logistics Coordinator to determine what BHP resources can be mobilised to Learmonth.

**8 h**
- Secure accommodation and rental vehicles in Exmouth.
- Engage with WA DoT regarding co-location of Forward Operating Bases.

**16 h**
- Confirm IT connection to Forward Operating Base is available.

**24 h**
- BHP representative on site in Learmonth / Exmouth including IT support to establish telephone / satellite communications and intranet / internet connections.
- BHP representative establishes ground logistics plan with Exmouth Light Industrial.

**>24 h**
- Complete daily safety analysis for next 24 h period.
- Carry forward logistics requirements as per IAP.

**Figure 6-18: First strike plan – Forward operating base**

**Supporting Information**

Harold Holt Naval Base (Primary FOB), Exmouth SES (Secondary FOB) & Ningaloo Resort (Tertiary FOB).

Exmouth Shire contact: 08 9949 1875

SES Exmouth contact: SES Local Manager: 08 9949 1488 (24/7)

Department of Defence (DoD) Harold Holt Base contact: 08 9311 2500

## Environmental Performance Standards

Table 6-26 provides the environmental performance outcomes, performance standards and measurement criteria for the implementation of Forward Command Post response strategy.

**Table 6-26: Environmental performance – Forward operating base**

| RS12 Forward Operating Base | | |
|---|---|---|
| **Environmental Performance Outcome** | **Forward operating base will be maintained to facilitate effective and sustained response deployment** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate the establishment of a Forward Operating Base (FOB) following a Level 2 or Level 3 hydrocarbon spill | Incident log | IMT (IC) |
| BHP shall undertake all forward operating base establishment tasks within the defined timeframes as per the forward operating base first strike plan | Incident log / communication records | IMT (IC) |
| BHP shall maintain the FOB to coordinate regional response activities for the duration of the oil spill response. | Incident log / communication records | IMT (IC) |

## 6.14 RS13 Oil Contaminated Waste Management

### Response Implementation

**Table 6-27: Response implementation – Oil contaminated waste management**

| RS13 Oil Contaminated Waste Management | |
|---|---|
| **Response Objective** | Conduct waste management operations in compliance with relevant waste treatment, transport and disposal regulations and in a manner consistent with waste management hierarchy Western Australia Oil Spill Contingency Plan Marine Oil Pollution Waste Management Guidelines. |
| **Initiation Criteria** | Hydrocarbon spill (Level 2 / 3) |
| **Responsible** | BHP IMT (IC) |
| **Controlling Agency** | BHP IMT |
| **Emergency Contact**<br>**Refer APU Emergency Contact Directory (EMQnet)** | North West Waste Alliance, Karratha |
| **Activation Time** | <24 hours after notification from BHP IMT. |
| **Implementation Plan / Guidance Document** | APU Oil Spill Response Strategy – RS13 Waste Management (AOHSE-ER-0063).<br>APU Waste Management Plan – Oil Spill (AOHSE-E-0014-001).<br>Western Australia Oil Spill Contingency Plan Marine Oil Pollution Waste Management Guidelines.<br>IPIECA Oil spill waste minimisation and management: Good practice guidelines for incident management and emergency response personnel. |
| **Termination Criteria** | No further oiled waste is being generated by marine recovery, oiled wildlife, shoreline protection and/or the shoreline clean-up response strategies. |

## Environmental Performance Standards

Table 6-28 provides the environmental performance outcomes, performance standards and measurement criterial for the implementation of Oil Contaminated Waste Management response strategy.

**Table 6-28: Environmental performance – Oil contaminated waste management**

| RS13 Oil Contaminated Waste Management | | |
|---|---|---|
| **Environmental Performance Outcome** | **Waste management operations conducted in compliance with relevant waste treatment, transport and disposal regulations and in a manner consistent with waste management hierarchy Western Australia Oil Spill Contingency Plan Marine Oil Pollution Waste Management Guidelines.** | |
| **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| BHP shall initiate waste management operations following a Level 2 or Level 3 hydrocarbon spill. | Incident log | IMT (IC) |
| BHP shall undertake an Operational SIMA and preliminary IAP and within 24 hours of an incident, to inform mobilisation of site waste management response requirements. | Operational SIMA / IAP / Incident log | IMT (IC) |
| BHP shall engage the services of a regional Waste Contractor and request the mobilisation of equipment and personnel within 24 hours of notification. | Contract / Communication records | IMT (IC) |
| BHP shall undertake waste management in accordance with the APU Waste Management Plan – Oil Spill (AOHSE-E-0014-001) and in a manner consistent with Western Australia Oil Spill Contingency Plan Marine Oil Pollution Waste Management Guidelines. | Waste records | IMT (IC) |
| BHP shall undertake monitoring to determine the ongoing acceptability of the environmental risk associated with waste management methods. | Inspection records | IMT (IC) |
| BHP shall facilitate the management of oil contaminated waste for the full duration of the spill response until no further oiled waste is being generated by marine recovery, oiled wildlife, shoreline protection and/or the shoreline clean-up response strategies. | Incident log / waste records | IMT (IC) |

# Appendix A – APU IMT Capability Analysis

BHP

# APU Incident Management Team (IMT) Capability Assessment Report

**Document No: AOHSE-ER-0071**

| REVISION RECORD | | | | | | |
|---|---|---|---|---|---|---|
| **Rev** | **Date** | **Description** | **Prepared by** | **Checked by** | **Reviewed by** | **Approved by** |
| 0 | 13.12.21 | Issued for NOPSEMA assessment | Environment Principal Projects | Principal Environment & Regulatory | Head of Drilling & Completions - Australia | Asset Manager |
| | | | | | | |

## APU INCIDENT MANAGEMENT TEAM (IMT) CAPABILITY ASSESSMENT

| Revision History | | |
|---|---|---|
| **Revision Label** | **Revision Date** | **Comments** |
| A | 18/10/2021 | Draft Issued for internal review |
| B | 09/12/2021 | Internal comments incorporated |
| 0 | 13/12/2021 | Issued for NOPSEMA assessment |
| | | |
| | | |

# Contents

# List of Tables



# List of Figures

## Acronyms and Glossary

| Term | Description |
|---|---|
| **AMOSC** | Australian Marine Oil Spill Centre |
| **AMSA** | Australian Maritime Safety Authority (Cwlth) |
| **APPEA** | Australian Petroleum Production and Exploration Association |
| **APU** | BHP Australian Production Unit |
| **BHP** | BHP Petroleum Pty Ltd |
| **BIP** | Bridging Implementation Plan |
| **BOD** | OPEP: Basis of Design & Field Capability Assessment |
| **BOP** | Blow-out preventer |
| **C&R** | Containment and recovery |
| **CEM** | Crisis & Emergency Management |
| **CMT** | Crisis Management Team |
| **COP** | Common operating picture |
| **EMBA** | Environment that may be affected |
| **EMQNet** | Online crisis & emergency management system |
| **EMT** | Emergency Management Team |
| **EOC** | Emergency Operations Centre |
| **EP** | Environment Plan |
| **EPO** | Environmental Performance Outcome |
| **EPS** | Environmental Performance Standard |
| **ERP** | Emergency Response Plan |
| **ERT** | Emergency Response Team |
| **FOB** | Forward Operational Base |
| **FPSO** | Floating production storage and offloading facility |
| **FRT** | Field Response Team |
| **FWAD** | Fixed wing aerial dispersant |
| **GIS** | Geographic information system |
| **HSE** | Health, Safety and Environment |
| **HSE DAT** | BHP Petroleum HSE document storage system (online) |
| **IAP** | Incident Action Plan |
| **IC** | Incident Commander |
| **ICS** | Incident Command System |
| **IGN** | Industry Guidance Note |
| **IMH** | BHP Incident Management Handbook |
| **IMP** | APU Incident Management Plan |
| **IMR** | Integrity Management & Response |
| **IMT** | Incident Management Team |
| **IMTCA** | APU Incident Management Team Capability Assessment (this document) |
| **IOGP** | International Oil and Gas Producers |
| **JSCC** | Joint Strategic Coordination Committee |
| **LEL** | Lower explosive limits |
| **LO** | Liaison Officer |
| **LOWC** | Loss of well control |
| **$m^2$** | Square metre |
| **MDO** | Marine diesel oil |
| **MODU** | Mobile offshore drilling unit |
| **MoU** | Memorandum of Understanding |
| **NOPSEMA** | National Offshore Petroleum Safety and Environmental Management Authority (Cwlth) |
| **OIM** | Offshore Installation Manager |
| **OM** | Operational monitoring program |
| **OMS** | BHP APU Operations Management System |
| **OPEP** | Oil Pollution Emergency Plan |
| **OPICC** | Offshore petroleum incident coordination committee |
| **OSM** | Oil spill monitoring |
| **OSMBIP** | Operational and Scientific Monitoring Bridging Implementation Plan |
| **OSMP** | Operational and Scientific Monitoring Program |
| **OSRA** | Oil Spill Response Agency |
| **OSRL** | Oil Spill Response Limited |
| **OSRO** | Oil spill response organisation |
| **OSTM** | Oil spill trajectory modelling |
| **OWR** | Oiled wildlife response |
| **P&D** | Protection and deflection |
| **PIC** | Person in charge |
| **ROV** | Remotely operated vehicle |
| **RS** | Response Strategy |
| **SAR** | Search and rescue |
| **SCAT** | Shoreline clean-up assessment technique |
| **SCS** | Source Control Section |
| **SCSC** | Source Control Section Chief |
| **SCERP** | Source Control Emergency Response Plan |
| **SFRT** | Subsea First Response Toolkit |
| **SHP-MEE** | State Hazard Plan – Maritime Environmental Emergencies |
| **SIMA** | Spill Impact Mitigation Assessment |
| **SIMOPS** | Simultaneous operations |
| **SIRT** | Subsea Incident Response Toolkit |
| **SMPC** | State Marine Pollution Coordinator |
| **SMV** | Surveillance, monitoring and visualisation |
| **SOPEP** | Shipboard Oil Pollution Emergency Plan |
| **SPEAR** | Safety of Personnel, the Environment, Assets and Reputation |
| **SSDI** | Subsea dispersant injection |
| **UK** | United Kingdom |
| **VOC** | Volatile organic compound |
| **WA** | Western Australia |
| **WA DBCA** | Department of Biodiversity, Conservation & Attractions (WA) |
| **WA DoT** | Department of Transport (WA) |
| **WAIO** | BHP Western Australia Iron Ore |
| **WCD** | Worst-case Discharge |

# 1 Purpose

The purpose of this document is to:

- Assess the BHP Incident Management Team (IMT) capability which would be required to mobilise and maintain the oil spill response field capability for a credible worst-case oil pollution emergency (i.e., a LOWC scenario), during the initial ramp-up period of the response, until the IMT has reached its peak/plateau work output and team size.
- Provide an overview of the BHP IMT capability and linkages to the BHP Crisis Management Team (CMT), Emergency Management Team (EMT), the BHP Source Control Section (SCS), the Oil Spill Monitoring (OSM) Management Team and linkages to field-based Emergency Response Teams (ERTs), and with mutual aid capabilities including external oil spill response organisations (OSROs).
- Provide Environmental Performance Outcomes (EPOs) and Environmental Performance Standards (EPSs) related to the BHP IMT / SCS capability and arrangements for oil spill response (refer Section 4).

# 2 BHP Response Organisation Structure

As detailed within the BHP APU Incident Management Plan (AO-HSE-ER-0001), BHP utilises the Incident Command System (ICS) to manage emergencies. ICS is a proven on-scene all-hazard management system that is appropriate for all types of incidents regardless of size, from the time an incident occurs until the requirement for management and operations no longer exists. The ICS organisation is made up of five core functions. These are Command, Operations, Planning, Logistics, and Finance. They are applied during any emergency, when proactively preparing for possible events, or when managing a response to an emergency.

## 2.1 BHP Crisis and Emergency Management (CEM)

The BHP Crisis and Emergency Management (CEM) philosophy is based on four levels of emergency response teams (refer to Figure 2-1) which allow for a flexible response with the appropriate level of leadership and support, according to the nature of the specific incident.

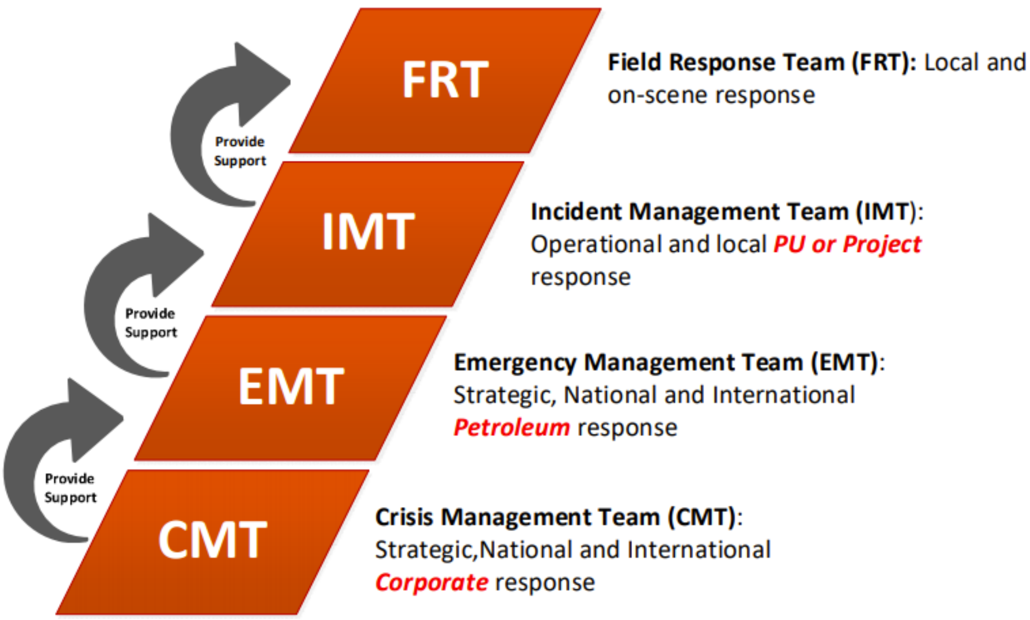



**Figure 2-1: BHP CEM structure**

The following sections describe the teams listed in Figure 2-1 based on a credible worst-case discharge spill scenario from BHP operated assets i.e., a full loss of well control (LOWC). At the time of writing, the largest potential WCD scenario identified for BHP operated assets is associated with the Pyrenees Phase 4 Infill Drilling Program, as described within the Pyrenees Infill Drilling Program Environment Plan (BHPB-04PY-N950-0021). Likewise, this IMT Capability Assessment has been developed to meet the capability needs detailed within the Pyrenees Phase 4 Basis of Design and Field Capability Assessment (BHPB-04PY-N950-0002). Future revisions of this IMT Capability Assessment must be evaluated against the current WCD scenarios for BHP operated assets at the time of review.

### 2.1.1 Field Response Team (FRT)

The FRT is responsible for physically controlling incidents in the field or incident scene, where possible, and communicating known facts to the IMT. The senior person in charge (PIC) of the facility/site shall be responsible for the overall site emergency response to protect people, the environment, assets and reputation.

In the event of a Level 2 or Level 3 spill in Commonwealth jurisdiction, BHP will form the FRT via the APU IMT. For spills within or entering State jurisdiction, the Western Australian Department of Transport (WA DoT) is the Controlling Agency, as such, FRTs (Field Units) shall be formed at the direction of WA DoT.

The capability analysis for the Field Units is presented within the activity-specific Basis of Design and Field Capability Assessments. At the time of writing, the Pyrenees Phase 4 Basis of Design and Field Capability Assessment (BHPB-04PY-N950-0002) provides a description of the field capability required for the largest potential WCD scenario identified for BHP operated assets.

Roles and responsibilities of the offshore FRTs are detailed in Table 2-1, noting multiple FRTs with varying functional objectives may be deployed depending on the nature and scale of the actual emergency oil pollution event. FRTs are supported by the APU IMT, who in turn are supported by the EMT and CMT.

**Table 2-1: BHP FRT roles and responsibilities**

| Role | Responsibilities |
|---|---|
| **Emergency Commander** | The Emergency Commander has overall responsibility for management of an incident. For MODU-related incidents, this will be the MODU Operator PIC with support from the BHP Drilling Supervisor or for subsea infrastructure incidents this will be the Pyrenees FPSO Offshore Installation Manager (OIM). |
| **On-Scene Commander** | The On-Scene Commander is responsible for determining the status of the emergency and providing assistance to the Emergency Commander, as requested. |
| **Emergency Communications Coordinator** | The role of the Emergency Communications Coordinator is to provide a link between all operating responders and to assist them in controlling the incident. |
| **Emergency Coordinator** | The Emergency Coordinator provides technical support during the emergency response and communicates with the Emergency Commander. |

### 2.1.2 APU Incident Management Team (IMT)

The APU IMT is responsible for the initial spill response for all Level 2 and Level 3 spills and directly supporting the FRTs. The BHP APU Incident Management Plan (AO-HSE-ER-0001) outlines the roles and responsibilities of personnel in all response scenarios. APU IMT core and support roles are shown in Figure 2-2 with allocated responsibilities, including those for oil spill scenarios, for core roles detailed in Table 2-2 and support roles in Table 2-3.

The APU IMT is made up of personnel designated on a roster basis, with each individual available for one week on a 24-hour basis throughout the year, based in Perth. There is a weekly handover and briefing of the operations each week. The APU IMT is located in the BHP Perth offices and is fully equipped to manage incidents.

AMOSC or OSRL deputies assigned to the APU IMT will be responsible for providing BHP guidance on the Incident Command Structure process and oil spill response strategies. Guidance and support will be available via phone/video conference.

The BHP IMT functions are consistent with the functions as defined in the Australian Petroleum Production and Exploration Association (APPEA) Guidance Document: Incident Management Teams Knowledge Requirements for Responding to Marine Oil Spills (APPEA, 2021).

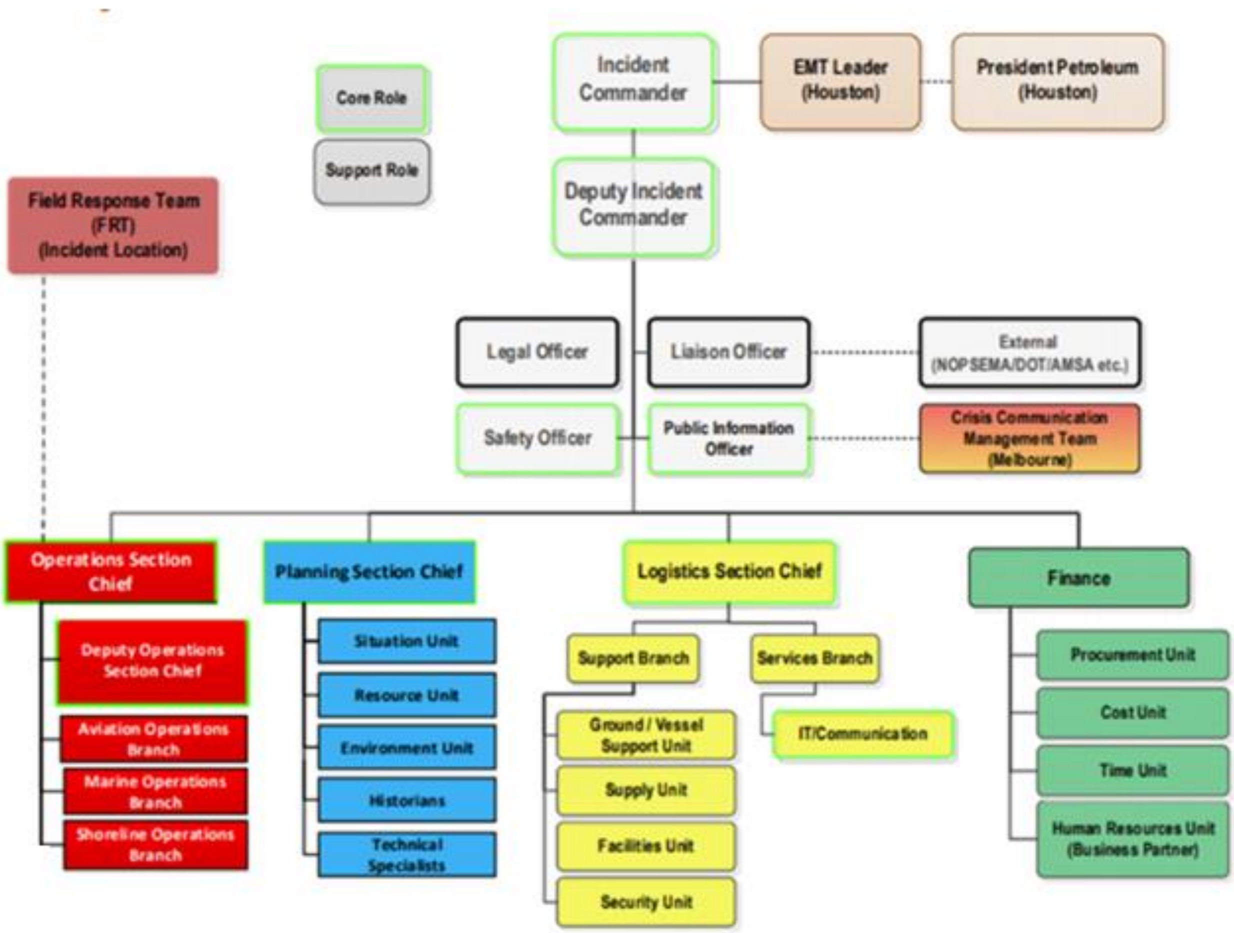



**Figure 2-2: APU IMT organisational chart**

During offshore drilling activities, and additional core position of Source Control Section Chief is instated within the APU IMT structure. Australia IMT Core Group members shall always be on standby to respond to an incident during roster period, including the Source Control Section Chief during offshore drilling activities. IMT

Support Groups shall be activated by the Incident Commander according to the specific requirements of the incident.

The Australian IMT shall be managed according to the following criteria:

- All core roles are rostered IMT members and are expected to remain within 1 hour of the Perth office throughout the duty period of one week and be fit to respond at short notice outside of normal office hours.
- The requirement for additional support functions as part of the incident response will be dictated by the actual incident, and will be mobilised at the discretion of the Incident Commander.
- Initial and main response to a drilling incident will be by the Drilling Contractor, from their management base offices. If a BHP response is warranted then the IMT will convene, and Drilling Contractor personnel may be called to attend the IMT Room.
- The IMT may need to call on members of the EMT to support its response to some incidents. Under these circumstances, the Incident Commander will liaise with the EMT Leader regarding the provision of this support but will remain in charge of the response.
- The Roles and Responsibilities of the IMT and its individual members are contained within the BHP Incident Management Handbook (IMH). Additional spill response responsibilities are presented in Table 2-2 as blue text.
- Responses to any Level 2 or Level 3 oil spill may require the formation of a specialised team that may replace or support the IMT. Information regarding activation and mobilisation of resources for an APU spill is outlined in the activity-specific Oil Pollution Emergency Plan (OPEP).
- All BHP Emergency Response Plans are available on BHP's intranet via BHP Petroleum HSE DAT, the BHP Australian Production Unit Operations Management System (APU OMS) and EMQnet, with duplicate documents also maintained at alternate locations.

**Table 2-2: BHP IMT core roles, responsibilities and resourcing strategy**

| Role | Responsibilities | BHP / OSRO / MoU / Service Provider |
|---|---|---|
| **Incident Commander** | The Incident Commander (IC) is responsible for overall incident management and activating and managing the IMT, including the initiation and implementation (via delegation) of activity-specific Oil Pollution Emergency Plans (OPEPs) and related spill response procedures.<br>The IC is responsible for supplying BHP (or delegate) personnel requested by WA DoT consistent with Appendix 3 of the WA DoT Offshore Petroleum Industry Guidance Note (IGN) – Marine Oil Pollution: Response and Consultation Arrangements (July, 2020). | **BHP** |
| **Planning Section Chief** | The Planning Section Chief is responsible for providing planning services for the incident. Under the direction of the Planning Section Chief, the Planning Section collects situation and resources status information, evaluates it, and processes the information for use in developing action plans. Dissemination of information can be in the form of the IAP, informal briefings, or through map and status board displays. | **BHP** |
| **Operations Section Chief** | The Operations Section Chief is responsible for managing all tactical operations at an incident. The Incident Action Plan (IAP) provides the necessary guidance. The need to expand the Operations Section is generally dictated by the number of tactical resources involved and is influenced by span of control considerations. | **BHP** |

| Role | Responsibilities | BHP / OSRO / MoU / Service Provider |
|---|---|---|
| | Responsible for oversight of source control operations as detailed within the activity-specific Source Control Emergency Response Plan (SCERP). | |
| **Source Control Section Chief** | Reports to the Incident Commander and is responsible for the management of all well source control operations. The Source Control Section Chief activates and supervises source control operational elements in accordance with the Incident Action Plan (IAP) and directs its execution. The SCSC also directs the preparation of source control plans necessary to re-establish well control, requests, or releases resources, makes expedient changes to the IAP, as necessary, and reports such to the Incident Commander. | **BHP** |
| **Deputy Operations Section Chief (Aviation / Marine Unit Leader)** | Reports to the Operations Section Chief and is responsible for immediately managing and tasking aircraft, vessels or shoreline response teams as directed.<br>Aerial and marine dispersant application. | **BHP IMT** |
| **Logistics Section Chief** | The Logistics Section Chief provides all incident support needs including sourcing and engaging all non-BHP dedicated and / or non-contracted aircraft and vessels. The Logistics Section is responsible for providing: Facilities; Transportation; Communications; Supplies; Equipment Maintenance and Fuelling; Food Services (for responders); Medical Services (for responders); Waste Management (including oil contaminated); and all off-incident resources. | **BHP IMT** |
| **Safety Officer** | Reports to Incident Commander and is responsible for managing the IMT related safety, health and environmental matters for the BHP response. | **BHP IMT** |
| **Public Information Officer** | Reports to Incident Commander and is responsible managing the IMT related media / stakeholder issues for the BHP response. Compiles and releases information on the incident and response efforts to the news media and organises IMT press conferences and briefings with support from the Corporate Affairs Crisis Communications function. Depending on the situation and applicable legislation, may work with government agency media and external affairs representatives to produce joint press releases, hold joint press conferences, meetings and perform related tasks in an integrated effort. Responsible for undertaking ongoing stakeholder engagement in a manner consistent with activity-specific Environment Plans and associated stakeholder engagement processes. | **BHP IMT** |
| **Communications / IT Unit Leader** | Reports to the Logistics Section Chief and advises on the IT / Communications implications of the incident. | **BHP IMT** |

**Table 2-3: BHP IMT support roles, responsibilities and resourcing strategy**

| Role | Responsibilities | BHP / OSRO / MoU / Service Provider |
|---|---|---|
| **Situation Unit Leader (Planning Section)** | Responsible for collecting, processing and organising the display of information about the incident and the nature and status of the response operation. This will involve the use of EMQnet, status boards, maps and other items to enable the situational awareness for the IMT members and supporting agencies, including NOPSEMA and the WA DoT (as the Controlling Agency in State jurisdiction). | **BHP IMT** |

| Role | Responsibilities | BHP / OSRO / MoU / Service Provider |
|---|---|---|
| **Historian / Logkeeper (Planning Section)** | Responsible for assisting with documentation of all meetings and briefings associated with and outside the planning cycle process, including tracking action items. | **BHP IMT** |
| **GIS Specialist (not on org structure)** | Assists the Planning Section and Situation Unit Leader to gather and compile updated incident information and providing various map products for other IMT Sections. | **BHP IMT** |
| **Finance / Administration Section Chief** | The Finance/Administration Section Chief is responsible for managing all financial aspects of an incident. Not all incidents will require a Finance/Administration Section. Only when the involved agencies have a specific need for finance services will the Section be activated. | **BHP IMT** |
| **Liaison Officer** | Reports to the Incident Commander and acts as a point of contact for external agencies including State and Federal government agencies. Coordinates Liaison Officer role for WA DoT consistent with WA DoT Offshore Petroleum Industry Guidance Note (IGN) – Marine Oil Pollution: Response and Consultation Arrangements (July, 2020). | **BHP IMT** |
| **Supply Unit Leader** | Responsible for providing assistance with purchase of goods and services including the provision of purchase orders and 1SAP purchasing administration. | **BHP** |
| **Environmental Unit Leader** | Discipline specialist responsible for providing specific information to assist with response.<br>Responsible for disseminating relevant information from activity-specific EP and OPEP (and associated response documentation) to the IMT to support IAP development and revision in a timely manner.<br>Support initial notifications to regulators/stakeholders.<br>Complete initial Operational SIMA.<br>Support activation of other surveillance, monitoring and visualisation (SMV) (i.e. satellite tracker buoys, satellite imagery, etc.)<br>Conduct BHP resources at risk assessment.<br>Assist Planning Function Lead with development of IAP tasking for SMV and at-sea response strategies.<br>Activate Oil Spill Monitoring (OSM) Management Team. | **BHP** |
| **OSM Implementation Lead (not on org structure)** | Reports to the BHP Environmental Unit Leader.<br>Implement BHP OMS BIP.<br>Commence notification/activation of OSMP Contractors.<br>Evaluate situational awareness information against OSMP activation triggers to determine relevant operational monitoring programs (OMs) for immediate activation.<br>Provide logistics with specifications of suitable OSMP vessels/platforms. | **OSM Service Provider** |
| **Staging Area Manager (not on org structure)** | Management of entire staging areas located at field locations. Operates under the Operations Section.<br>Responsible for oversight of establishment and management of BHP Forward Operating Base and field response staging areas. | **BHP / AMOSC Core Group** |
| **Intelligence / Security Officer (not on org structure)** | Development and implementation of any specific security plans required in support of the response including liaison with local security agencies. | **BHP** |
| **Human Resources Officer** | Reports to the Incident Commander and identifies and tracks all personnel involved in the incident. Management of all | **BHP** |

| Role | Responsibilities | BHP / OSRO / MoU / Service Provider |
|---|---|---|
| | personnel issues including family liaison and communication with contractors as appropriate. | |
| **Telephone Response Team (not on org structure)** | Reports to the Human Resources Officer. A general support team activated to assist with answering, filtering and recording increased number of phone calls or enquiries during an incident. | **BHP** |
| **Legal Officer** | Reports to the Incident Commander and manages IMT related legal matters for the BHP response, by assessing the Company's legal liabilities and responsibilities and provides advice to the IMT and other Company personnel on the legal implications of the Company's response-related policies, decisions, plans and operations, regulatory requirements and investigation issues. This function may be activated in the EMT. | **BHP** |
| **Shoreline Operations Branch** | Reports to the Operations Section Chief. In consultation with Liaison Officer, establish direct liaison with WA DoT Controlling Agency SCAT personnel.<br>Under direction of WA DoT:<br>• Agree SCAT data recording processes, systems and tools.<br>• Agree BHP versus WA DoT available SCAT/shoreline response resources/personnel.<br>• Provide logistics with specifications of suitable remote response SCAT/shoreline vessels/platforms.<br>• Commence early mobilisation of SCAT/shoreline response resources/personnel to FOB.<br>Under direction of WA DoT / WA DBCA:<br>• Assist in coordination of initial oiled wildlife response (OWR) personnel to support first remote SCAT team<br>• Interface with relevant wildlife experts/subject matter experts, to assist in defining OWR priorities and provide input to SIMA processes. | **BHP / AMOSC Core Group** |
| **Aboriginal Heritage Officer (not on or structure)** | Responsible for engaging with relevant statutory agencies in relation to Aboriginal heritage.<br>Responsible for advising the IMT on appropriate aboriginal engagement and management strategies in the event of potential exposure of Aboriginal heritage sites or lands to hydrocarbon spills, or for the potential access of responders to Aboriginal heritage sites or lands. | **BHP** |

### 2.1.3 BHP IMT Source Control Section (SCS)

In the event of a loss of well control (LOWC) incident the BHP Source Control Section Chief will establish a Source Control Section (SCS).

The SCS implements the activity-specific Source Control Emergency Response Plan (SCERP). The SCS develops and implements strategies and tactics to regain control of the well and stop or contain the discharge of hydrocarbons. These include:

- the coordination of engineering safety and operational activities,
- the development of task-specific plans and procedures,
- the identification of required tools and equipment,
- monitoring progress in achieving well control.

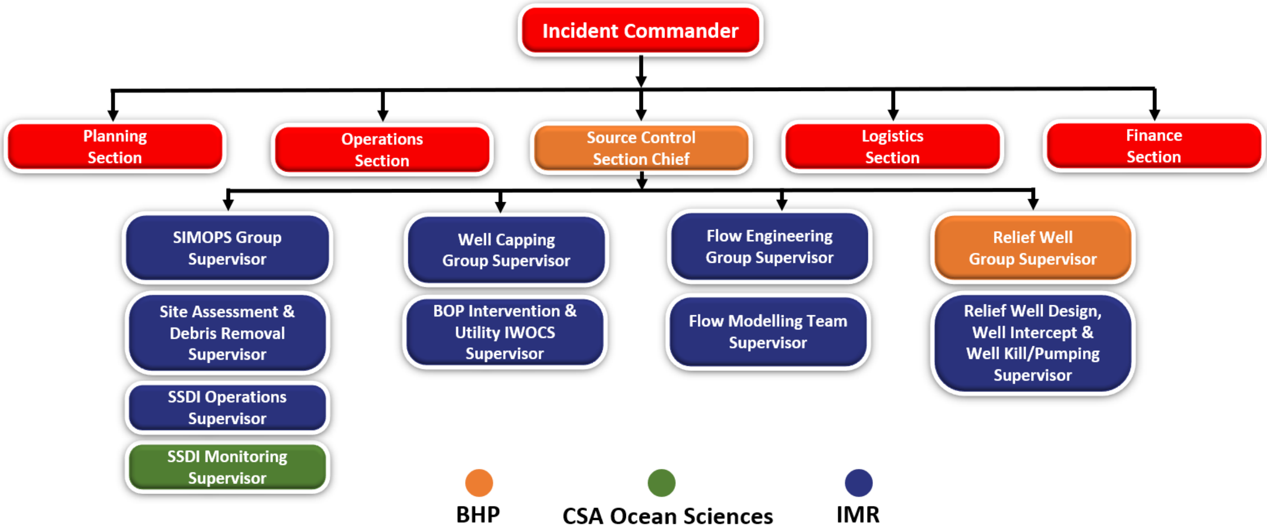



**Figure 2-3: APU Source Control Section organisational chart**

Perth-based BHP Well & Seismic Delivery (WSD) representatives will fill the roles of Source Control Section Chief and the Relief Well Group Supervisor. These positions will be supported by Houston-based WSD representatives. BHP has retained Integrity Management & Response (IMR) to staff SIMOPS Group Supervisor, Well Capping Group Supervisor, and Flow Engineering Group Supervisor roles and associated functions reporting to those roles Table 2-4.

IMR will fulfil these roles remotely from their dedicated Emergency Operations Centre (EOC) in Houston, USA and link into the Perth-based BHP IMT virtually via platforms such as Microsoft Teams or Webex.

**Table 2-4: BHP Source Control Section roles, responsibilities and resourcing**

| Role | Responsibilities | BHP / OSRO / MoU / Service Provider |
|---|---|---|
| **SIMOPS Group Supervisor** | Ensure safety and effectiveness of source control activities by:<br>• Establishing control of the designated area<br>• Identifying and communicating with resources in and around the designated area, including establishing the common operating picture<br>• Management and coordination for the subsea site assessment, clearing of any debris to allow well access, | **Integrity Management & Response (IMR)** |

| Role | Responsibilities | BHP / OSRO / MoU / Service Provider |
|---|---|---|
| | and deploying subsea dispersant and water column monitoring equipment | |
| **Well Capping Group Supervisor** | Coordinate all well capping operations, including developing incident specific procedures, the preparation and deployment of the capping stack, and management and co-ordination of an intervention on the BOP of the incident well. | **Integrity Management & Response (IMR)** |
| **Flow Engineering Group Supervisor** | Develop plan to monitor and conduct flow and production operations for the well including management and coordination of reservoir and flow modeling, estimation of the flow rate, flow assurance, hydrate inhibition requirements, subsea dispersant requirements, well integrity assessment, well kill procedures, and development of soft shut in procedure including expected pressure response ranges. | **Integrity Management & Response (IMR)** |
| **Relief Well Group Supervisor** | Coordinate the planning and execution to drill relief well(s) to re-establish control of the well including development of the drilling plan, drilling procedures, sourcing resources, and managing relief well operations to ensure the relief well successfully reaches its target. | **BHP (Perth-based)** |

### 2.1.4 IMT Oil Spill Monitoring (OSM) Team

The Incident Management Team (IMT) will be responsible for coordinating OSM activities, which will be led by the Planning Section within the IMT, with support from each Section, in particular the Operations Section. The BHP IMT structure is shown in previous Figure 2-2.

For monitoring operations within State jurisdiction, the Western Australian Department of Transport (WA DoT) (as the Controlling Agency), will set monitoring priorities that BHP will implement with oversight from WA DoT.

Figure 2-4 illustrates the structure of the Oil Spill Monitoring (OSM) Management Team during the response phase. The IMT Incident Commander is ultimately accountable for managing the response operation, which includes this plan. Depending on the scale of the event, individual people may perform multiple roles; similarly, multiple people may share the same role.

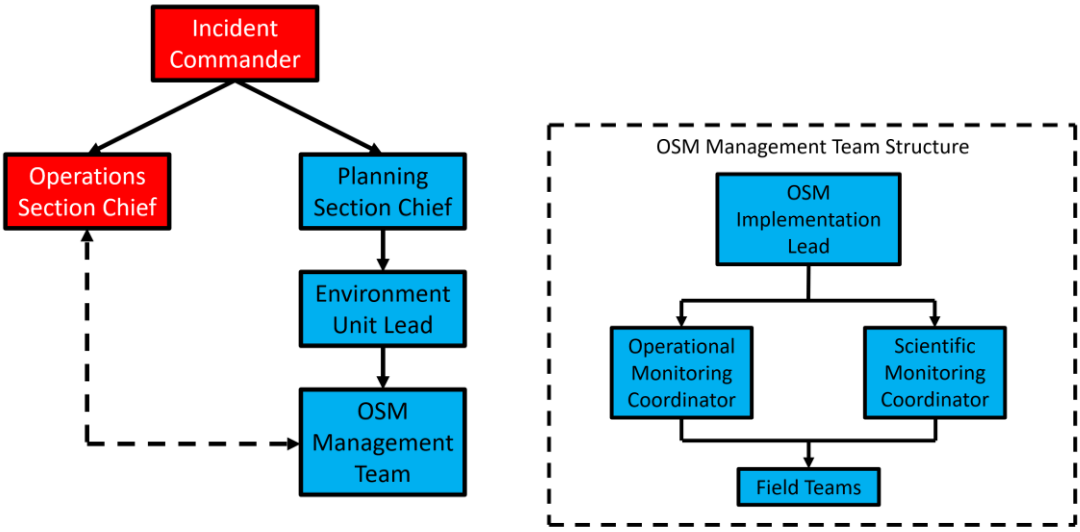



**Figure 2-4: APU OSM Management Team organisational chart**

Table 2-5 outlines the roles held by BHP and the OSM Service Providers.

During the post-response phase the BHP APU HSE Principal (Environment & Regulatory) and the OSM Service Providers OSM Implementation Lead will continue to be responsible for the coordination and delivery of monitoring plans.

**Table 2-5: OSM Roles (BHP and Service Providers)**

| Role | Resourcing Strategy |
|---|---|
| **Environmental Unit Leader** | BHP APU HSE Principal (Environment & Regulatory) (or delegate) |
| **OSM Implementation Lead** | OSM Service Providers |
| **Operational Monitoring Coordinator and Scientific Monitoring Coordinator** | OSM Service Providers |
| **OSM Field Operations Manager** | OSM Service Providers |
| **OSM Field Teams** | OSM Service Providers |

### 2.1.5 State Jurisdiction IMT

Figure 2-5 outlines the control structure in the event of that the marine oil pollution incident has, or has the potential to, impact State waters.

BHP will use its existing IMT Control Room in Perth. In Western Australia, the following arrangements apply:

1. BHP will be the Controlling Agency for spills from offshore petroleum activities in Commonwealth waters;
2. AMSA is the Control Agency for vessel spills (Commonwealth waters); and
3. Western Australian DoT (WA DoT) is the Control Agency for a Level 2 / Level 3 emergency event in State waters resulting from an offshore petroleum activity (in accordance with changes to the State Hazard Plan – Maritime Environmental Emergencies (SHP-MEE)). The WA DoT will only assume the role of Controlling Agency for that portion of the response activity that occurs within State waters as detailed in Appendix 2 (Lead IMT Responsibilities) of the WA DoT Offshore Petroleum Industry Guidance Note (IGN) – Marine Oil Pollution: Response and Consultation Arrangements (July, 2020).

This is regardless of whether the source of the spill is located in Commonwealth or State waters. WA DoT will send a Liaison Officer to the CEM as shown in Figure 2-5.

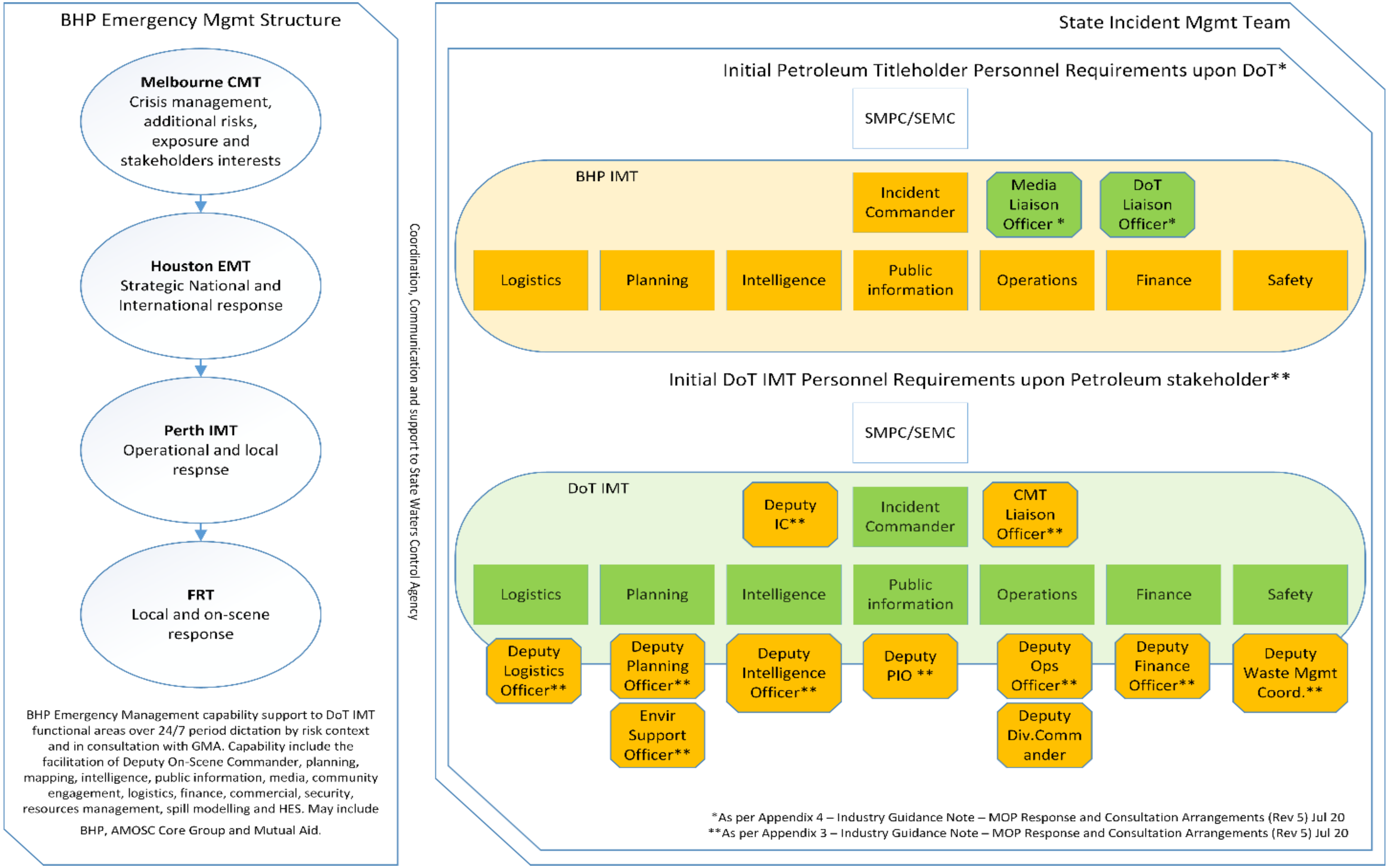



**Figure 2-5: Emergency management support to State waters Control Agency – as per WA DoT IGN requirements**

To facilitate the overarching coordination between the two Controlling Agencies and their respective IMT's, a Joint Strategic Coordination Committee (JSCC) will be established (Figure 2-6). The JSCC will be jointly chaired by the State Marine Pollution Coordinator (SMPC) and the BHP's nominated senior representative and will comprise of individuals deemed necessary by the chairs to ensure an effective coordinated response across both jurisdictions.

BHP will continue to provide initial response actions for State waters, until such time that WA DoT assumes control and subsequently will provide resources in line with the BHP organisation chart and the OPEP.

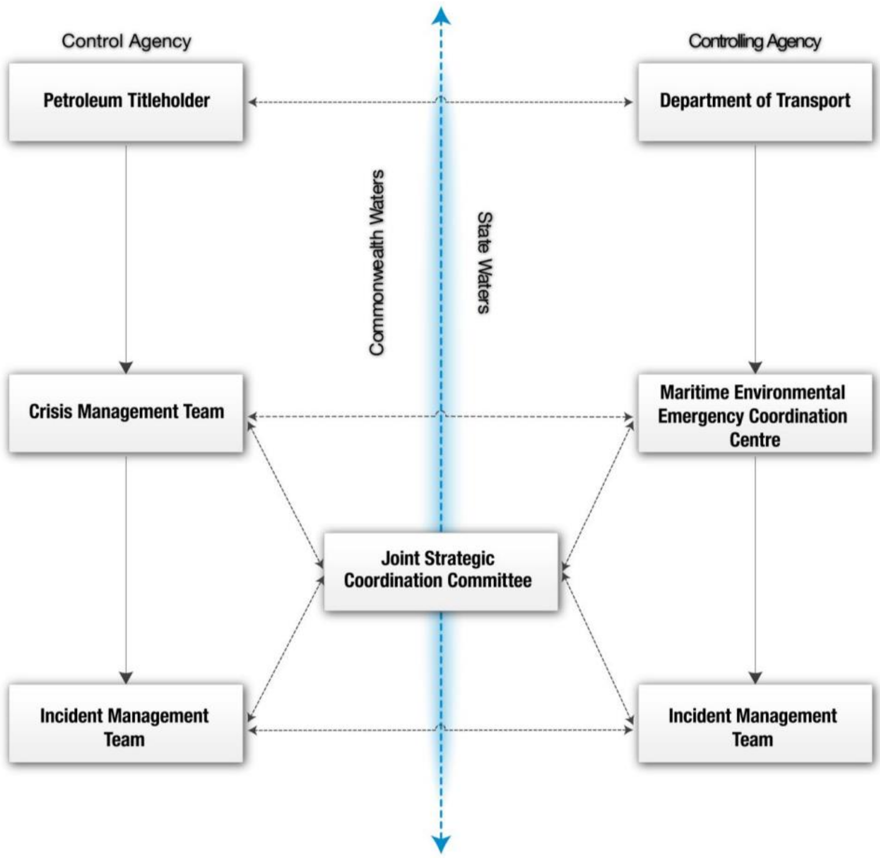



**Figure 2-6: Controlling Agency coordination arrangements – Cross jurisdictional (WA DoT, 2020)**

### 2.1.6 IMT Resourcing Arrangements

This section details the BHP IMT resourcing arrangements in place to respond to a potential WCD scenario (i.e., full LOWC) including internal BHP IMT capacity (inclusive of Source Control Section), Oil Spill Response Organisations (OSROs), industry mutual aid agreements, and specialist technical support Service Providers.

#### BHP IMT

BHP maintains Crisis and Emergency Management (CEM) metrics inclusive of the availability and competency of IMT personnel. These metrics are validated on a quarterly basis to ensure sufficient resourcing may be called upon in the event of a major incident, including an emergency oil pollution event.

Australian Production Unit (APU)

BHP currently has 50 Perth-based APU staff qualified to fulfil BHP IMT positions. Of those, 40 Perth-based APU staff qualified to fulfil core BHP IMT positions.

BHP currently has 6 Perth-based Well & Seismic Delivery (WSD) personnel qualified to fulfil core BHP IMT SCS positions. The BHP Head of Drilling and Completions Australia and Drilling Superintendent would typically fulfil the role of Source Control Section Chief (SCSC) and Deputy SCSC respectively. Other core roles would typically be fulfilled by BHP Well & Seismic Delivery (WSD) representatives.

Additional BHP APU personnel (and contract staff), not on the APU IMT would be resourced due to their specific discipline to provide support to the IMT. Perth office has around 100 APU personnel that would fulfil this requirement.

Off rostered personnel from the Pyrenees and Macedon facilities would also be available to provide personnel support if required.

Minerals Australia

Additional BHP EMTs / IMTs are housed within Minerals Australia are located at 125 St Georges Terrace. Minerals Australia IMT similarly functions under the ICS and have similar IMT resources to the APU. These personnel are available under existing internal Mutual Aid Arrangements and can be called upon by the BHP CMT.

Western Australia Iron Ore (WAIO)

Additional BHP EMTs / IMTs are housed within WAIO collated within the Pilbara Region. WAIO similarly functions under the ICS and currently have 50+ EMT Personnel and 100+ IMT personnel based in the Pilbara Region. These personnel are available under existing internal Mutual Aid Arrangements and can be called upon by the BHP CMT. Given the proximity of these resources to the Exmouth region, the WAIO IMT would likely be called upon to support regional FRTs.

International BHP Personnel

As all events would be managed by the online EMQnet system, additional BHP resources could be sourced remotely i.e. BHP Operations in Trinidad and Tobago, Gulf of Mexico and Houston. These resources can be called upon by the BHP CMT.

BHP currently has 2 additional Houston-based staff qualified to fulfil core SCS positions (remotely).

## OSRO Arrangements

BHP maintains contractual arrangements with oil spill response organisations (OSROs) which include the provision of technical specialists to supplement the BHP IMT.

Australian Marine Oil Spill Centre (AMOSC)

BHP maintains an ‘associate’ membership with AMOSC. This arrangement provides BHP with access to the AMOSC personnel and the AMOSC Core-Group, under AMOSPlan.

The AMOSC Core-Group is an Australian industry initiative that was initially crafted in 1992. It is unique within the international context and is noted for being innovative and effective to rapidly expand and surge well trained personnel into a spill response. The AMOSC Core-Group has attended most Australian-based spills and also several offshore spills.

The AMOSC Core-Group has around 30-40 IMT personnel and 50-70 field operators.

AMOSC Core Group policy requires all Core-Group personnel to undertake initial training, followed by competency re-validation/training every 2 years.

Typically, AMOSC manage the Core-Group re-validation/training by conducting 3 x 1 week Core-Group training/workshops per year.

AMOSC coordinates the routine testing, monitoring and monthly reporting of Core-Group personnel availability.

Oil Spill Response Limited (OSRL)

BHP is a member of the OSRL group. OSRL have capacity to mobilise additional equipment and personnel to APU from their Singapore location. Only nominated BHP personnel may request the assistance of OSRL via the IMT Leader under OSRL's Service Level Agreement.

The OSRL service level statements provides for:

- 24/7 call-out arrangements.
- Guaranteed initial response from OSRL of 5 technical support personnel (IMT or field personnel) for 5 days (pending Covid-19 restrictions).
- Surge to 18 OSRL personnel, upon request from the BHP IMT (pending Covid-19 restrictions).
- Depending on size/complexity, OSRL maintain 80 response team personnel globally, who are potentially able to be provided to support an ongoing Level 3 event, on a best-endeavours basis.

OSRL service level statement defines the types of services provided by the 18 person surge capability as:

- Technical advice and incident management coaching within the command centre.
- Development of an Incident Management Plan.
- Tier 1 / 2 equipment readiness and training of contractors.
- In-country logistics planning and support for inbound equipment.
- Impact assessment and advice on response strategy selection.
- SCAT and aerial surveillance / quantification surveys.
- Tactical response planning.

OSRL also has a Memorandum of Understanding (MoU) with AMOSC, and OSRL may also be activated by AMOSC to provide resources to AMOSC to respond to a situation. Following initial spill notification, OSRL may be mobilised if required within 8 hours.

## Industry Mutual Aid Arrangements

APPEA MoU framework

As a member company, BHP would seek to engage the services of Perth-based specialist personnel (as required) from other Petroleum Titleholders under the APPEA Industry Memorandum of Understanding (MoU) (2021).

OSRL MoU framework

As a member company, BHP would seek to engage the services of Perth-based specialist personnel (as required) from other Petroleum Titleholders under the ORSL Memorandum of Understanding (MoU) framework.

## Well Control Specialists

BHP has retained Integrity Management & Response (IMR) to fulfill the function of the SCS for the Australian Production Unit. These contracted specialists have the capability to fulfil all core and support roles within the BHP IMT SCS and cover all aspects of source control operations, including engineering, response coordination, integrity management, and relief well planning and execution.

Additionally, BHP has Master Service Agreements in place with established well control specialist organisations namely:

- The Response Group;
- Wild Well Control; and
- Add Energy.

## Technical Support (Environmental Monitoring)

BHP has arrangements in place with specialist Service Providers to provide environmental monitoring services in support to the emergency response teams. These Service Providers would make available personnel, with environmental science qualifications and environmental monitoring skills, to rotate through field monitoring positions. Service Providers also have staff that could be rotated through specialist avifauna environmental monitoring positions, which could be expanded through access to the Birds Australia network.

## COVID-19 Readiness

In the first instance, personnel would be sourced locally (both internal BHP and via external arrangements). Where support services are engaged from international sources, technical specialists have the ability to work remotely via standard communication platforms. Where entry to international responders is required, BHP shall facilitate in accordance with current government guidelines and in consultation with relevant regulatory bodies.

## 2.1.7 APU IMT Oil Spill Response Objectives

This section describes the IMT oil spill response objectives based upon a worst-case Level 3 oil pollution event i.e., a full LOWC scenario used to inform the IMT Response Capability Analysis in Section 2.1.8.

**Table 2-6: IMT spill response objectives**

| Operational Period | IMT Spill Response Objectives | Rationale / Justification |
|---|---|---|
| 0 – 24 Hours | 1. Establish/maintain an IMT with appropriate oil spill response trained personnel including mutual aid capabilities for specialist oil spill roles.<br>2. Implement activity-specific First Strike Plan (EMQnet).<br>3. Gain situational awareness of the safety of MODU crew and operability of MODU and LOWC scenario.<br>4. Gain situational awareness of spill trajectory, weathering, and potential environmental impact (use of response strategies/tactics including OSTM, visual surveillance, satellite imagery, SCAT surveys, and use of IMT tools including SIMA, resources at risk evaluation, and common operating picture (COP).<br>5. Conduct regulatory and other stakeholder notifications.<br>6. Establish cross-jurisdictional IMT coordination & resourcing arrangements with WA DoT.<br>7. Establish Forward Operational Bases (FOBs)/Staging Areas for aviation, shore and marine response strategies (e.g. establish FOBs at Learmonth Airport, Exmouth Port, Dampier Port, as required).<br>8. Pre-deploy shoreline assessment/response capabilities including SCAT, OWR, resource protection and shoreline clean-up resources to FOB in anticipation of future deployment.<br>9. Mobilise/activate at sea response strategies, including:<br>• Activate in-field vessel based dispersant and commence dispersant spraying<br>• Mobilise FWAD capability to Learmonth<br>• Mobilise C&R capability at Exmouth port.<br>10. Initiated IMT SCS for implementation of SCERP.<br>11. Mobilise SFRT / SSDI spread to FOB via AMOSC.<br>12. Undertake risk assessments and develop Health, Safety and Environment (HSE) plan(s). | 1. Establishing and maintaining an IMT is required to ensure that field response activities are undertaken consistent with BHP's regulatory obligations (OPEP) and are appropriately scaled to the spill scenario at the time.<br>2. Activity-specific implementation plan in standardised format based upon nature & scale of WCD and outcomes of strategic SIMA process.<br>3. Understanding the operability of the MODU influences the Source Control IAP.<br>4. This is the primary spill response needed for the first 24 – 96 hours, and then acts as a foundation/principle objective for the duration of the spill. It enables all other decisions to be made in regards to field or actions around the spilt hydrocarbon, on the basis of predicted and observed environmental and other impacts, and weathering of the spill.<br>5. It is important to maintain regulatory and stakeholder relationships & a regulatory requirement.<br>6. JSCC required for first-strike (and ongoing) response in WA State jurisdiction as coordinated by Controlling Agency (WA DoT).<br>7. Establishment of FOBs is required to support the mobilisation/deployment and execution of marine, aviation and shoreline response strategies.<br>8. The Strategic SIMA and OPEP BOD identified that these strategies may be required to be executed early in the response (depending on the scenario). Noting the long-lead times for deployment of these response strategies, pre-deployment of equipment and personnel to a FOB will reduce timeframes between 'need identified' and 'response strategy deployed', which is especially important given the geographic isolation of the Exmouth Region.<br>9. The Strategic SIMA and OPEP BOD determined that these response strategies can (under the right circumstances) be used to reduce the environmental impact of a crude spill. Rapid deployment provides the highest |

| Operational Period | IMT Spill Response Objectives | Rationale / Justification |
|---|---|---|
| | 13. Activate and mobilise OSROs and mutual aid organisations.<br>14. Activate and mobilise OSM Team. | likelihood of successful use of these strategies.<br>10. Source control is primary response strategy for LOWC scenario.<br>11. SFRT / SSDI may be required may be required for subsea spills for debris clearance / VOC reduction / capping stack deployment activities. Early mobilisation of SFRT / SSDI spread ensures this activity is not on 'critical path' for other source control activities.<br>12. A risk assessment and HSE plan is required to be prepared, in order to assess the particular HSE risks associated with each relevant response strategy for the spill scenario.<br>13. OSROs and mutual aid organisations provide expertise and additional support into the IMT and field response capability.<br>14. OSM used to inform IAP. |
| 24 – 72 Hours | 1. Maintain and reinforce an IMT with appropriate support functions including oil spill response trained personnel and mutual aid capabilities for specialist oil spill roles.<br>2. Maintain situational awareness of spill trajectory, weathering, and any potential environmental impacts.<br>3. Support the mobilisation/deployment of response strategies/field capabilities through FOBs.<br>4. At the direction of WA DoT continue the pre-deployment of shoreline assessment/response capabilities including SCAT, OWR, resource protection, and shoreline clean-up resources to FOB in anticipation of future deployment.<br>5. Mobilise/activate at sea response strategies, including:<br>• continue in-field vessel based dispersant spraying<br>• continue mobilisation and/or commence FWAD spraying from a Learmonth Airport<br>• continue mobilisation of C&R capability from Exmouth / Dampier port – commence operations in the field if possible.<br>6. Mobilise SFRT / SSDI from FOB to field.<br>7. Review hazard assessments and execute HSE plans for operational activities. | 1. As above – ongoing.<br>2. As above – ongoing.<br>3. The IMT objective has shifted from establishing the FOBs to the operational activity taking place from these locations.<br>4. As above – ongoing.<br>5. Ongoing at sea response strategy operations should continue, based on a positive demonstrable environmental outcomes and weather conditions conducive to safe operations.<br>6. As above – ongoing.<br>7. The IMT objective now includes the ongoing conduct of risk assessments and preparation of a HSE plans, as well as the execution and ongoing review of the HSE plan for operational response strategies. |
| 72 Hours – onwards | 1. Maintain and reinforce an IMT with appropriate support functions including oil spill response trained personnel and | 1. As above – ongoing.<br>2. As above – ongoing. |

| Operational Period | IMT Spill Response Objectives | Rationale / Justification |
|---|---|---|
| | mutual aid capabilities for specialist oil spill roles.<br>2. Maintain situational awareness of spill trajectory, weathering, and potential environmental impacts.<br>3. Support the mobilisation/deployment of response strategies/field capabilities through FOBs or direct from international (e.g. Singapore).<br>4. At the direction of WA DoT, mobilise shoreline assessment/response capabilities including SCAT, OWR, resource protection and shoreline clean-up resources to Tactical Response Plan locations (or other locations as directed).<br>5. Mobilise/activate at sea response strategies, including:<br>• continue in-field vessel-based dispersant spraying.<br>• continue mobilisation and/or commence FWAD spraying from a Learmonth.<br>• commence/continue with C&R activities in the field.<br>6. Maintain SFRT / SSDI operations in field.<br>7. Review hazard assessments and execute HSE plan for operational activities. | 3. The IMT objective has shifted from establishing the FOBs to the operational activity taking place from these locations.<br>4. As above – ongoing.<br>5. The WA DoT (Controlling Agency) will determine the timing for actual activation of shoreline assessment and response capabilities from the FOB to the field.<br>6. As above – ongoing.<br>7. As above – ongoing. |

### 2.1.8 IMT Response Capability Analysis

This section presents an evaluation of potential BHP IMT resourcing need for a WCD scenario (i.e., full LOWC) against the IMT Resourcing arrangements presented within Section 2.1.6. The evaluation accounts for IMT personnel potentially requested by WA DoT consistent with Appendix 3 of the WA DoT Offshore Petroleum Industry Guidance Note (IGN) – Marine Oil Pollution: Response and Consultation Arrangements (July, 2020).

The resourcing evaluation presented within this section assumes the full BHP IMT is 'stood-up' including both 'core' and 'support' functions and is maintained for a minimum of 10 weeks at full capacity. This represents the modelled time to successfully enact a well kill operation in a LOWC scenario within the Pyrenees Field off the N.W. coast of Western Australia.

This section also details the resourcing needs to establish and maintain the BHP IMT Source Control Section (SCS) based upon the organisation structure detailed in Section 2.1.3 and assumes all source control response options detailed within the activity-specific SCERP are implemented in sequence and/or simultaneously where required.

The IMT response capability analysis is based upon the BHP IMT meeting the oil spill response objectives presented in Section 2.1.7 and meeting capability need at different time steps during the ramp-up of the response until peak capacity.

The analysis determines the number of personnel required within each IMT function.

The IMT capability assessment process is undertaken utilising the following steps:

1. Determine the IMT functions required at defined periods during IMT ramp-up. The periods defined for this IMT capability analysis are:
    - 0 – 12 hours
    - 12 – 72 hours
    - 72 hours – Peak (steady-state)
2. Define the number of personnel required in each IMT function, to manage the response during the defined periods.

This analysis adopted the following assumptions:

- All IMT functions are stood-up over the response;
- 2x 12 hour operational periods per day;
- Some core IMT functions required for 2x 12 hour operational periods per day whilst other support functions would primarily be required for 1x 12 operational period per day;
- Some IMT functions require rotational rosters. Rotations shall be established based upon the nature and scale of a real event, with rosters likely to be 2 week on / 1 week off;
- Following the peak at 10 weeks some IMT functions may be required for extended durations until termination criteria of various response strategies have been met;
- BHP IMT roles may be supported by personnel from OSROs, industry mutual aid agreements, and specialist technical support Service Providers.

The IMT capability analysis is presented in Table 2-12.

In summary, the IMT capability analysis concluded a total numbers of IMT personnel required for each defined period is as follows:

- 0 – 12 hours; 26 personnel required.
- 12 – 72 hours; 79 personnel required.

- 72-hours – Peak (steady-state) – 120 personnel required.

With the IMT resourcing arrangements detailed within Section 2.1.6, all IMT roles can be filled within the defined ramp-up periods and sustained for peak (steady-state) response need. Further detail is provided within the following section.

The initial 12 hours would be dominated by BHP APU IMT personnel and a small contingent of AMOSC and possibly OSRL personnel (if required). As the IMT capability increases over the coming days/weeks, more of the OSRO and contracted technical support can be brought into the IMT, to facilitate the rotation of BHP IMT personnel in and out of the IMT (e.g. commencing two-on one-off rotations). In addition, more internal BHP IMT personnel from WAIO and or Minerals Australia will be able to be inducted/trained in the oil spill response, as the response transitions from a rapidly evolving reactive response phase to a more proactive, steady-state, project phase response.

Figure 2-7 shows an indicative BHP IMT resourcing curve, demonstrating how the BHP, OSROs and Specialist technical services (other) resources could be utilised to fulfil IMT requirements.

BHP's response arrangements can be scaled up or down dependent on the nature and scale of the incident and response requirements.

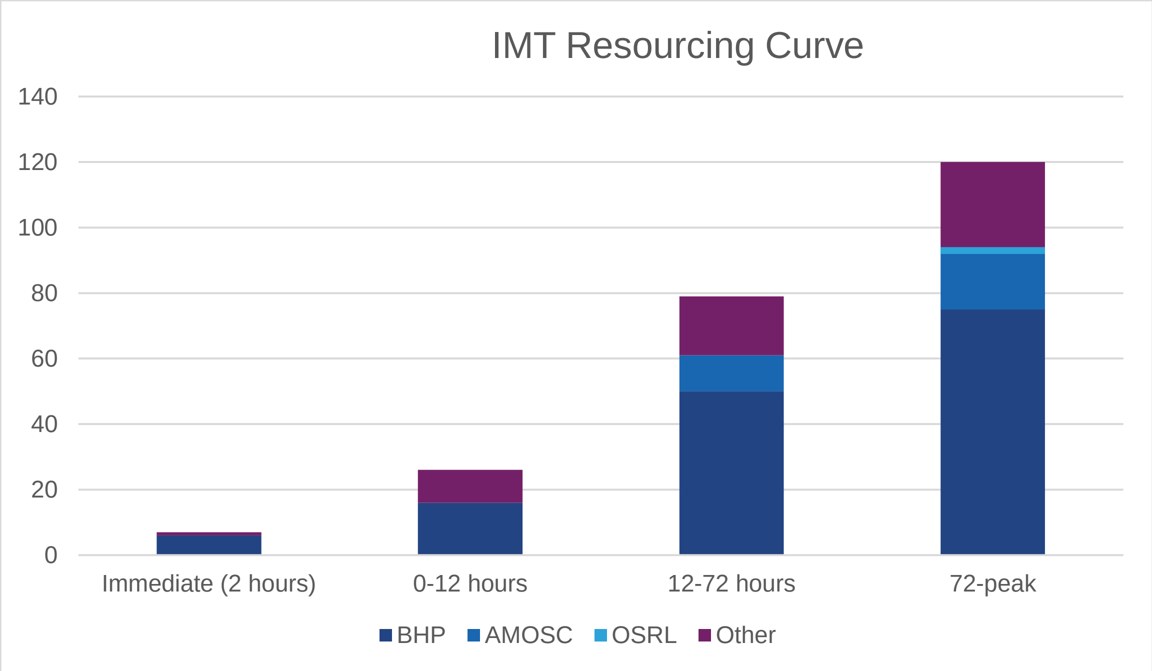



**Figure 2-7: Indicative IMT resourcing curve**

**Table 2-7: BHP IMT potential resourcing needs for WCD scenario**

| Function / Position | 12 hour / 24 hours | 0 – 12 hours | 12 – 72 hours | 72 hours – peak | Rotational Support |
|---|---|---|---|---|---|
| **IMT Core** | | | | | |
| Incident Commander | 24 | 1 | 2 | 2 | 3 |
| Deputy Incident Commander | 24 | 0 | 2 | 2 | 3 |
| Planning Section Chief | 24 | 1 | 2 | 2 | 3 |
| Deputy Planning Section Chief | 24 | 0 | 2 | 2 | 3 |
| Operations Section Chief | 24 | 1 | 2 | 2 | 3 |
| Deputy Operations Section Chief (Aviation / Marine Unit Leader) | 24 | 0 | 2 | 2 | 3 |
| Source Control Section Chief (Perth-based – day shift) | 12 | 1 | 1 | 1 | 1.5 |
| Source Control Section Chief (Houston-based – night shift) | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Source Control Section Chief (Perth-based – day shift) | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Source Control Section Chief (Houston-based – night shift) | 12 | 0 | 1 | 1 | 1.5 |
| Logistics Section Chief | 24 | 1 | 2 | 2 | 3 |
| Deputy Logistics Section Chief | 24 | 0 | 2 | 2 | 3 |
| Safety Officer | 24 | 1 | 2 | 2 | 3 |
| Public Information Officer | 24 | 1 | 2 | 2 | 3 |
| Communications / IT Unit Leader | 24 | 1 | 2 | 2 | 3 |
| | **Total need** | 8 | 26 | 26 | 39 |
| **IMT Support** | | | | | |
| Situation Unit Leader (Planning Section) | 24 | 1 | 2 | 2 | 3 |
| Historian / Logkeeper (Planning Section) | 24 | 1 | 2 | 2 | 3 |
| GIS Specialist | 12 | 0 | 1 | 1 | 1.5 |
| Finance / Administration Section Chief | 12 | 0 | 1 | 1 | 1.5 |
| Liaison Officer | 12 | 1 | 1 | 1 | 1.5 |
| Supply Unit Leader | 12 | 1 | 1 | 1 | 1.5 |
| Environmental Unit Leader | 12 | 1 | 1 | 1 | 1.5 |
| Staging Area Manager | 12 | 0 | 6 | 6 | 9 |
| Intelligence / Security Officer | 12 | 0 | 1 | 1 | 1.5 |
| Human Resources Officer | 12 | 1 | 2 | 2 | 3 |
| Telephone Response Team (not on chart) | 12 | 0 | 1 | 2 | 3 |
| Legal Officer | 12 | 1 | 1 | 2 | 3 |
| Aboriginal Heritage (not on chart) | 12 | 0 | 1 | 2 | 3 |
| Shoreline Operations Branch Leader | 12 | 1 | 1 | 1 | 1.5 |
| | **Total need** | 8 | 22 | 25 | 38 |
| **Source Control Section** | | | | | |
| Well Capping Group Supervisor | 24 | 1 | 2 | 2 | N/A |

| Function / Position | 12 hour / 24 hours | 0 – 12 hours | 12 – 72 hours | 72 hours – peak | Rotational Support |
|---|---|---|---|---|---|
| BOP Intervention & Utility IWOCS Supervisor | 24 | 1 | 2 | 2 | N/A |
| SIMOPS Group Supervisor | 24 | 1 | 2 | 2 | 3 |
| Site Assessment & Debris Removal Supervisor | 12 | 1 | 1 | 1 | N/A |
| SSDI Operations Supervisor | 24 | 1 | 2 | 2 | 3 |
| SSDI Monitoring Supervisor | 24 | 0 | 0 | 2 | 3 |
| Flow Engineering Group Supervisor | 24 | 1 | 2 | 2 | 3 |
| Flow Modelling Team Supervisor | 24 | 1 | 2 | 2 | 3 |
| Relief Well Group Supervisor (Perth-based) | 24 | 1 | 2 | 2 | 3 |
| Relief Well Design, Well Intercept & Well Kill / Pumping Supervisor | 24 | 1 | 2 | 2 | 3 |
| | **Total need** | 9 | 17 | 19 | 21 |
| **Cross Jurisdictional DoT IMT Personnel Initial Requirement** | | | | | |
| CMT Liaison Officer | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Incident Controller | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Intelligence Officer | 12 | 0 | 1 | 1 | 1.5 |
| Environment Support Officer | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Planning Officer | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Public Information Officer | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Logistics Officer | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Finance Officer | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Operations Officer | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Waste Management Coordinator | 12 | 0 | 1 | 1 | 1.5 |
| Deputy Division Commander | 12 | 0 | 1 | 1 | 1.5 |
| | **Total need** | 0 | 11 | 11 | 17 |
| **OSM Management Team** | | | | | |
| OSM Implementation Lead | 12 | 1 | 1 | 1 | 1.5 |
| Operational Monitoring Coordinator and Scientific Monitoring Coordinator | 12 | 0 | 1 | 1 | 1.5 |
| OSM Field Operations Manager | 12 | 0 | 1 | 1 | 1.5 |
| | **Total need** | 1 | 3 | 3 | 5 |

## IMT Response Capability (Immediate 0-2 hours)

IMT Core (Total need 6 positions)

BHP maintains an IMT duty roster that is updated weekly with a minimum of 8 qualified IMT personnel to fulfil core BHP IMT positions. A minimum of 4 personnel are rostered 'on-call' at any time to immediately fulfil the role of Incident Commander, Operations Section Chief, Planning Section Chief and Logistics Unit Leader. During offshore drilling activities, a BHP Well & Seismic Delivery (WSD) representative will be rostered 'on-call' to fulfil the role of Source Control Section Chief. Additionally, the 24/7 Technology Remote Operating Centre remains 'on-call' to immediately fulfil the BHP IMT IT / Communications Unit Leader position.

Each 'on-call' person is to be within 1 hour of the office and fit for work at all times.

Each position has additional personnel trained for support.

The IMT duty roster enables the formation of the BHP IMT within 2 hrs of the notification of an incident.

## IMT Response Capability (0-12 hours)

IMT Core (Total need 8 personnel within 12 hours)

BHP currently has 40 Perth-based APU staff qualified to fulfil core or support BHP IMT positions.

IMT Support (Total need 8 personnel within 12 hours)

BHP currently has 50 Perth-based APU staff qualified to fulfil support BHP IMT positions, 42 of which would be available to fulfil support positions once core IMT positions are filled.

IMT SCS (Total need 9 personnel within 12 hours – LOWC only)

A BHP WSD representative will fulfil the role of the Relief Well Group Supervisor. BHP would initiate call-off contracts with IMR to establish the remainder of the SCS structure.

OSM Management Team

A BHP APU Environmental Unit Leader is available within the first 12-hours to initiate call-off contracts with specialist OSM Service Providers. Service Provider to engage OSM Implementation Lead within 12 hours.

Additional Support

Whilst BHP has the capability to fulfil all required core and support IMT roles within the first 12 hours of an incident, additional support could be engaged via arrangements detail within Section 2.1.6.

## IMT Response Capability (12-72 hours)

IMT Core (Total need 26 personnel within 12-72 hours)

The BHP CMT may call upon any additional BHP internal resource as detailed within Section 2.1.6 to support the 40 Perth-based APU staff covering core or support BHP IMT positions. These internal resources could be mobilised within this time-frame to maintain core IMT roles in Perth.

IMT Support (Total need 22 personnel within 12-72 hours)

The BHP CMT may call upon any additional BHP internal resource as detailed within Section 2.1.6 to support the 50 Perth-based APU staff covering core or support BHP IMT positions. These internal resources could be mobilised from Perth or regionally within this time-frame to maintain support IMT roles. AMOSC core group members would likely be call upon to provide support if required.

IMT SCS (Total need 17 personnel within 12-72 hours – LOWC only)

Internal BHP WSD personnel (both Perth and Houston-based) would fulfil core SCS roles during this period and supply technical support to the SCS Group Supervisors. IMR would support the SCS structure and BHP would call upon additional technical support via industry MoU framework agreements (as required). Within this timeframe, local technical specialists would be on-boarded into the BHP IMT SCS within Perth whilst international technical specialists would supply remote support to the SCS.

Cross Jurisdictional DoT IMT Personnel (Total need 11 personnel within 12-72 hours)

Over this period, and in consultation with DoT, these 11 positions would likely be sustained and supplemented by AMOSC Core Group personnel in combination with BHP personnel.

OSM Management Team (Total need 3 personnel within 12-72 hours)

As per the arrangements detailed within Section 2.1.6, OSM monitoring contracts would be initiated and roles fulfilled via contracted personnel. The BHP APU Environmental Unit Leader would remain.

Additional Support

Additional support would be engaged via arrangement detail within Section 2.1.6 over this time period.

## IMT Response Capability (72 hours – peak)

IMT Core (Total need 26 personnel up to 39 personnel on rotation)

A rotational roster would be implemented and BHP internal resource would primarily fulfil core IMT roles in Perth for the full duration of the incident. The core roles may be supplemented by external personnel on-boarded within the BHP IMT, these would likely include OSRO personnel as required.

IMT Support (Total need 25 personnel up to 38 personnel on rotation)

A rotational roster would be implemented and BHP internal resource would primarily fulfil support IMT roles both in Perth and regionally for the full duration of the incident. The support roles may be supplemented by external personnel on-boarded within the BHP IMT, these would likely include OSRO personnel and AMOSC core group as required.

IMT SCS (Total need 19 personnel up to 21 personnel on rotation – LOWC only)

A rotational roster would be implemented and internal BHP APU personnel would continue to fulfil core SCS roles during this period. Additional SCS support would be rostered by IMR and potentially supported by industry secondees accessed via MoU framework agreements. International technical specialists would supply remote support to the SCS until such time as they could be mobilised to Perth (if required).

Cross Jurisdictional DoT IMT Personnel (Total need 11 personnel up to 17 on rotation)

In consultation with DoT, a rotational roster would be implemented to sustain these 11 positions with a combination of AMOSC Core Group and BHP personnel (or contractors).

OSM Management Team (Total 3 contractor positions up to 5 contractor personnel on rotation)

A rotational roster would be agreed with OSM contractors to sustain all OSM Team positions for the duration of the incident and up to the point where termination criteria of OSM monitoring has been achieved in consultation with regulatory authorities.

Additional Support

Additional support would be engaged via arrangement detail within Section 2.1.6 over this time period.

### 2.1.9 BHP Emergency Management Team (EMT)

The EMT organisation is comprised of six primary roles which would be required to respond. Other support roles may be contacted to respond depending on the nature and severity of the event. The role of the EMT is to provide strategic leadership and support. The EMT Leader is notified within 15 minutes of IMT Activation by the Incident Commander or the BHP Emergency and Crisis Centre. The BHP APU EMT is based in Houston, USA. The EMT structure is show in Figure 2-8 and the roles and responsibilities are described in Table 2-8.

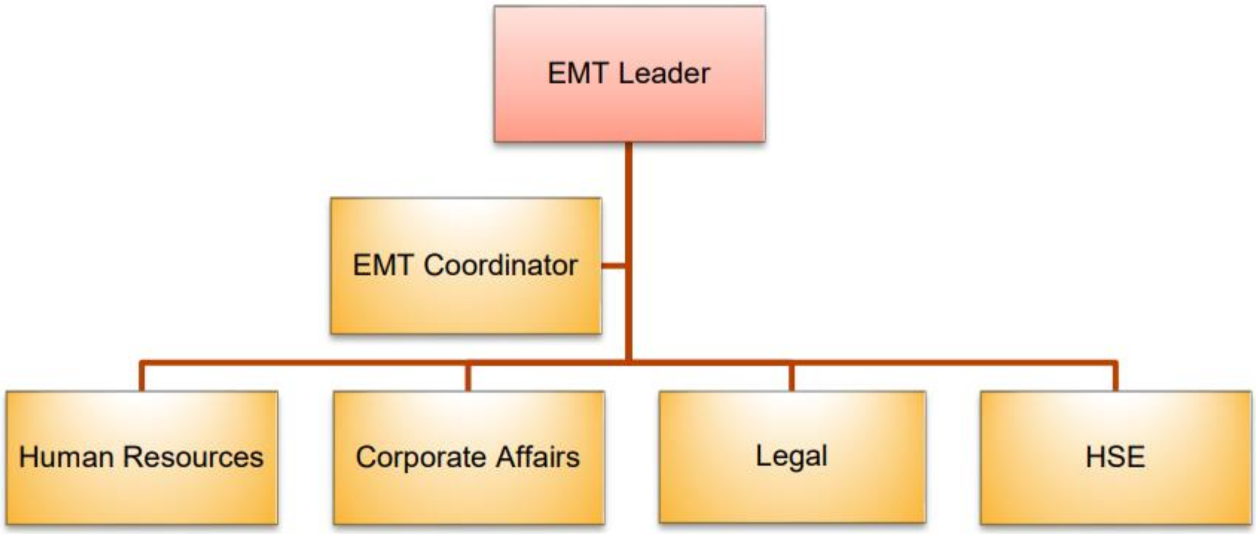



**Figure 2-8: EMT structure**

**Table 2-8: EMT roles and responsibilities**

| Role | Responsibilities |
|---|---|
| **EMT Leader** | Overall responsibility for managing the strategic response to an incident by setting strategic objectives, assigning tasks, and providing updates to the Asset General Manager, Petroleum President and Group Chief Executive Officer (CEO). |
| **EMT Coordinator** | The EMT Coordinator is responsible for coordinating all information management needs for the EMT. This includes documentation of incident information and providing administrative support to the EMT. |
| **Legal** | The Legal representative provides legal advice relating to (1) response activities, (2) potential liabilities or investigative issues, (3) regulatory requirements, and (4) in collaboration with Corporate Affairs, communications and disclosures to third parties, the public, employees, and other stakeholders. |
| **Corporate Affairs** | The Corporate Affairs function is responsible for managing internal and external stakeholders as well as the media and any communications relating to the incident. |
| **Human Resources** | The Human Resources (HR) function is responsible to determine and coordinate strategic response to the emergency from a human resources perspective. HR identifies and tracks all employees involved in the incident, coordinates and provides feedback to employees, ensures that consistent messages are conveyed internally (in consulation with Corporate Affairs), advises on HR issues. |
| **HSE** | Responsible for the safety and effective risk management of incident response and providing functional oversight and planning expertise for health, safety and environment. |
| **Security** | Security is responsible for the provision of specialist security advice pertinent to the incident and other affected locations. Security will also liaise with relevant international or local security agencies. |
| **Insurance** | Provide support on global insurance exposure, underwriting information and external insurance policies. |

# 3 IMT Competency Assessment

This section provides an analysis of training and competency requirements to ensure IMT personnel are suitably qualified to fill core or support IMT positions.

## 3.1 BHP IMT Training Overview

The following section describes the training that provided to the BHP IMT.

### 3.1.1 Response Personnel Training [Core Roles]

The BHP Petroleum Regional HSE Lead Australia is responsible for the overall management of the IMT including:

- Training and competency;
- Ensuring the IMT is adequately resourced; and
- Maintaining the associated training documentation for Emergency Response.

The BHP APU IMT is primarily resourced by personnel from the APU, except for the Legal team where additional external specialists make up part of the team. An individual is assigned to join the APU IMT roster by their line manager and the BHP Petroleum Regional HSE Lead Australia. Where possible the IMT role is aligned to the individuals' current role responsibilities (refer to Table 3-1). For example, the Operations Section Chief is drawn from the Engineering and Operations teams. This ensures that a person assigned to an IMT role brings a depth of technical knowledge to the APU IMT.

**Table 3-1: IMT competencies**

| IMT Position | Selected from | CEM Induction | ICS100 | ICS 200 |
|---|---|---|---|---|
| **Incident Commander** | Functional Managers | Y | Y | Y |
| **Operations Section Chief** | Engineers and Operations Specialists | Y | Y | Y |
| **Planning Section Chief** | Engineers / HSE | Y | Y | Y |
| **Source Control Section Chief** | Well & Seismic Delivery (WSD) team | Y | Y | Y |
| **Logistics Section Chief** | Supply Team | Y | Y | Y |
| **Human Resources Coordinator** | Human Resources Specialists | Y | Y | |
| **Environmental Unit Leader** | HSE Team | Y | Y | Y |
| **Public Information Officer** | External Affairs Specialists | Y | Y | |
| **Legal** | Legal Specialists and Internal Counsel | Y | Y | |
| **Safety Officer** | HSE Specialists | Y | Y | Y |

Once nominated for an IMT role, the candidate must complete the following Training and Assessment before engagement in an IMT role:

- An online BHP Crisis and Emergency Management (CEM) induction program;
- ICS 100/200;
- EMQnet Training; and
- IMT Role Specific Training Session.

Once in the role IMT members are required to participate in regular desktop exercises and major exercises as described above. The ad hoc mobilisation (EMQnet) drills are also arranged to test a range of IMT responses, including oil spill response..

The APU IMT is mobilised to the IMT Room located in the BHP offices 125 St Georges Terrace, Perth, Western Australia and is capable of responding to an incident within 1 hour of activation. Test call-out notifications are conducted each Thursday. In addition, a weekly unscheduled test notification is made to check response times to the call out message. IMT members will be identified to undertake further training to further develop in-house capabilities and knowledge around oil spill response. Alternative providers for the identified courses may also be used if they meet the required outcomes.

In order to implement and maintain core group competencies, BHP will align with current AMOSC practice of a skills maintenance program, which requires that members complete skills maintenance activity before the end of the 36 month timeframe (as outlined in the AMOSC Core Group Program and Policies). As part of the weekly IMT handovers, set desktop exercise's and additional oil spill response training, BHP maintain a continual improvement cycle of core group competencies and training in relation to oil spill response readiness.

### 3.1.2 BHP IMT Oil Spill Response Training

BHP provides IMT personnel with oil spill-specific training, inclusive of the content and initiation requirements of activity-specific Oil Pollution Emergency Plans (OPEPs).

In 2021, the APPEA Oil Spill Preparedness and Response Working Group (of which BHP is a member) developed a new APPEA Guidance Document: Incident Management Teams Knowledge Requirements for Responding to Marine Oil Spills (APPEA, 2021). At the time of preparation of this document, the APPEA (2021) guidance document was in a final draft version. BHP will revise the BHP IMT oil spill training course, to align with the APPEA (2021) guidance document once it is finalised.

BHP will train a minimum of 30 IMT personnel in oil spill response, and complete the roll-out of training on the schedule of timeframes to be agreed between the APPEA oil spill preparedness and response working group and NOPSEMA. Additionally, each supporting role seconded into the BHP IMT shall undertake onboarding inclusive of oil spill response training.

### 3.1.3 Well Control Training

The BHP Organisation, Development and Training Standard (DR-STD-PET-DC-0123) defines the well control technical training and competencies required for each discipline within the BHP Well & Seismic Delivery (WSD) team (refer Table 3-2). Each WSD Management, Engineering and Operations Supervisor role must well control training via an accredited training organization (IWCF or IADC WellSharp) to a certification 'Level 4 – Supervisor'. Recertification for Operations roles is required every 2 years, whilst for Engineering and Manager roles it is every 4 years.

### 3.1.4 Source Control Training and Competency

BHP IMT SCS Command and General Staff members must attain as a minimum ICS 100 and ICS 200 competencies. In addition, the Source Control Section Chief and Deputy complete the BHP Oil Spill Response Training (refer Table 3-2).

**Table 3-2: Source Control Section competencies**

| IMT Position | ICS100 | ICS 200 | Oil Spill Response |
|---|---|---|---|
| **Source Control Section Chief** | Y | Y | Y |
| **Deputy Source Control Section Chief** | Y | Y | Y |
| **SIMOPS Group Supervisor** | Y | Y | |
| **Well Capping Group Supervisor** | Y | Y | |

| IMT Position | ICS100 | ICS 200 | Oil Spill Response |
|---|---|---|---|
| **Flow Engineering Group Supervisor** | Y | Y | |
| **Relief Well Group Supervisor** | Y | Y | |

It is expected that any secondee into the BHP IMT SCS during a well control incident holds a relevant tertiary qualification, has relevant industry experience and has undertaken well control training via an accredited training organisation comparable with that detailed within the BHP Organisation, Development and Training Standard (DR-STD-PET-DC-0123).

### 3.1.5 OSM Management Team

Where the key OSM role is held by the Titleholder, BHP Environment Principals / IMT EULs hold relevant tertiary qualifications, minimum 10+ years industry experience in environmental management, CEM training (ICS 100 & 200) and/or AMOSC IMO2, and knowledge of BHP Monitoring Procedures / activity-specific OPEPs.

OSM Management Team personnel must have a sound knowledge of environmental science with appropriate levels of experience operating in the field within the oil and gas industry (refer Table 3-2). The OSM Implementation Lead and Scientific Monitoring Coordinator roles will be filled by Principal Environmental Scientists.

**Table 3-3: Scientific monitoring team competencies**

| OSM Team Role | Relevant tertiary qualification | >5 years field experience & knowledge of sampling designs | >2 years field experience | MSIC & TBOSIET | Coxswains, Marine Radio Operator |
|---|---|---|---|---|---|
| **Principal Environmental Scientist** | Required | Required | Required | Recommended | Recommended |
| **Environmental Scientist** | Recommended | Recommended | Required | Recommended | Recommended |

MSIC (Maritime Security ID)
TBOSIET = Tropical Basic Offshore Safety Induction and Emergency Training

In addition and where practicable, BHP will engage its most qualified local environment advisors in the initial stages of the monitoring program to help activate and mobilise monitoring teams and support the OSM Services Provider in the finalisation of monitoring designs.

### 3.1.6 Facility and Vessel ERT Training

Each facility and vessel ERT will maintain its own oil spill response training, commensurate with the risks and responses required. Vessel Masters and the OIM will complete mandatory minimum requirements under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, which includes oil spill response training.

Vessel Masters and OIMs will also ensure facility/vessel ERTs complete drills as scheduled in their relevant Contractor ERP, including Shipboard Oil Pollution Emergency Plan (SOPEP) drills.

# 4 Environmental Performance

This section provides Environmental Performance Standards related to BHP oil spill response capability arrangements to ensure BHP is prepared and ready to respond to oil spill events.

**Table 4-1: Environmental Performance Outcomes, Standards and Measurement Criteria for emergency response training, capability and testing**

| Environmental Performance Outcome | Environmental Performance Standard | Measurement Criteria |
|---|---|---|
| BHP will be prepared and ready to respond to oil spill events. | BHP shall validate OIM/vessel masters have complete mandatory minimum training requirements under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 which includes oil spill response training. | Records of training |
| | BHP shall validate Facility ERTs – conduct routine drills in accordance with the Facility ERPs, including SOPEP drills. | Records of training |
| | BHP shall validate contracted Vessel ERTs – conduct routine drills in accordance with the Vessel Contractor ERPs, including SOPEP drills. | Records of training |
| | BHP IMT core functions shall complete:<br>• An online BHP Crisis and Emergency Management (CEM) induction program;<br>• ICS 100/200;<br>• EMQNet Training; and<br>• IMT Role Specific Training Session. | Records of training |
| | BHP shall maintain a minimum of 40 personnel within the APU IMT trained to fulfil core IMT functions. | Records of training |
| | BHP shall maintain a minimum of 30 personnel within the APU trained in oil spill response training consistent with APPEA Guidance (2021). | Records of training |
| | BHP shall maintain access to an additional 50 personnel personnel trained in ICS 100/200 to fulfil BHP IMT functions. | Mutual aid agreements<br>Records of training |
| | BHP shall maintain an IMT duty roster and update weekly with a minimum of 8 qualified IMT personnel to fulfil core BHP IMT positions. A minimum of 4 personnel shall be rostered 'on-call' at any time to immediately fulfil the role of Incident Commander, Operations Section Chief, Planning Section Chief & Logistics Unit Leader to enable the formation of the BHP IMT within 2 hrs of the notification of an incident. | IMT Duty Roster records |

| Environmental Performance Outcome | Environmental Performance Standard | Measurement Criteria |
|---|---|---|
| | For the duration of offshore drilling activities, the BHP IMT duty roster will include an on-call BHP Well & Seismic Delivery (WSD) representative to fulfil the role of Source Contol Section Chief. | IMT Duty Roster records |
| | Internal BHP IMT SCS personnel shall have valid well control certification as described within the BHP Organisation, Development and Training Standard (DR-STD-PET-DC-0123). | Records of training |
| | For the duration of offshore drilling activities, BHP shall maintain a minimum of 6 BHP Well & Seismic Delivery (WSD) representatives in Perth trained to fulfil the roles of Source Control Section Chief and Relief Well Group Supervisor. | Records of training |
| | BHP shall retained Integrity Management & Response (IMR) to staff SCS roles and associated functions. | Service Level Agreement |
| | BHP shall maintain Master Service Agreements with established well control specialist organisations to supplement IMRs role in maintaining SCS roles and associated functions. | Service Level Agreement |
| | BHP shall validate that well control specialists seconded into the BHP IMT SCS during a well control incident hold relevant tertiary qualifications, have relevant industry experience to fill their designated role and have undertaken well control training via an accredited training organization comparable with that detailed within the BHP Organisation, Development and Training Standard (DR-STD-PET-DC-0123). | Training/induction records |
| | BHP shall maintain Service Level Agreement / membership with OSROs (AMOSC / OSRL) enabling the provision of technical specialists to supplement the BHP IMT either directly of via industry mutual aid framework agreements. | Service Level Agreement / Membership |
| | BHP shall maintain Service Level Agreements with specialist environmental monitoring companies with suitably qualified staff to enable the formation and ongoing functioning of the OSM Management Team following an emergency oil pollution incident and for the full duration of monitoring until termination criteria have been agreed in consultation with relevant regulatory authorities. | Service Level Agreement |
| | During any oil spill response, support personnel including mutual aid personnel joining the BHP IMT will be provided the following onboarding/induction: | Training/induction records |

## APU INCIDENT MANAGEMENT TEAM (IMT) CAPABILITY ASSESSMENT

| Environmental Performance Outcome | Environmental Performance Standard | Measurement Criteria |
| --- | --- | --- |
| | • scenario specific briefing on arrival/upon joining the IMT;<br>• BHP oil spill response training;<br>• An online BHP Crisis and Emergency Management (CEM) induction program;<br>• EMQNet Training; and<br>• IMT role specific training. | |
| | The BHP APU CEM metrics shall be reviewed on a quarterly basis, and prior to undertaking a new petroleum activity in Commonwealth waters. The CEM metrics review shall include:<br>• A performance dashboard detailing APU IMT test call response, IMT training status and exercise outcomes; and<br>• A BHP oil spill response dashboard detailing status of industry personnel / equipment readiness. | CEM metrics |
| | BHP IMT core functions shall be tested via a desktop exercise prior to undertaking a new activity. | Test records |
| | BHP shall validate IMT capability and competency arrangements prior to undertaking a new petroleum activity in Commonwealth waters against the credible WCD scenario and associated IMT response need to ensure sufficient IMT resourcing and competency to fulfil all core and support IMT roles required for the identified WCD scenario. | Review records |

# 5 Review of this document

This document shall be reviewed on an annual basis or before undertaking a new petroleum activity in Commonwealth waters. The review shall include:

- An assessment of activity-specific WCD scenario to ensure IMT capability is sufficient;
- A review of most recent CEM metrics (updated quarterly) to validate IMT needs can be met; and
- A review of learnings from spill response exercises (as required).

Additionally, this document shall be reviewed following a Level 2 / Level 3 emergency oil pollution emergency event.

# 6 References

Australian Petroleum Production and Exploration Association. 2021. Guidance Document; Incident Management Teams Knowledge Requirements for Responding to Marine Oil Spills. Prepared by APPEA in consultation with AMOSC. Perth. Australia.

IOGP-IPIECA Report 594: Source Control Emergency Response Planning Guide for Subsea Wells (IOGP-IPIECA, January 2019).

WA DoT. 2021. State Hazard Plan Maritime Environmental Emergencies. Prepared by WA Department of Transport. Approved by State Emergency Management Committee.

WA DoT. 2020. Offshore Petroleum Industry Guidance Note (IGN) – Marine Oil Pollution: Response and Consultation Arrangements.

# Appendix B – OPEP: Basis of Design and Field Capability Analysis

# Pyrenees Phase 4 OPEP: Basis of Design and Field Capability Assessment

**Document No: BHPB-04PY-N950-0002**

| REVISION RECORD | | | | | | |
|---|---|---|---|---|---|---|
| **Rev** | **Date** | **Description** | **Prepared by** | **Reviewed by** | **Reviewed by** | **Approved by** |
| 0 | 13/12/2021 | Issued for NOPSEMA assessment | Environment Principal Projects | Principal Environment & Regulatory | Head of Drilling & Completions - Australia | Asset Manager |
| | | | | | | |

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Revision History | | |
|---|---|---|
| **Revision Label** | **Revision Date** | **Comments** |
| A | 02/11/2021 | Draft Issued for Review |
| 0 | 13/12/2021 | Issued for NOPSEMA assessment |
| | | |
| | | |
| | | |

# Contents

# List of Tables



# List of Figures

## Acronyms and Glossary

| Term | Description |
|---|---|
| AFEDO | Ayles Fernie Even Drop Out |
| AIS | Automatic identification system |
| AHTS | Anchor handling tug supply (vessel) |
| ALARP | As low as reasonably practicable |
| AMOSC | Australian Marine Oil Spill Centre |
| AMSA | Australian Maritime Safety Authority (Cwlth) |
| APPEA | Australian Petroleum Production and Exploration Association |
| APU | Australian Petroleum Unit (BHP) |
| ASV | Accommodation support vessel |
| AUD/year | Australian dollars per year |
| AT | Air tractor |
| BAOAC | Bonn Agreement Oil Appearance Code |
| BIA | Biologically Important Area |
| BHP OPEP BOD/FCA Report | BHP OPEP Basis of Design (BOD) and Field Capability Assessment (FCA) Report |
| IMTCA | APU Incident Management Team Capability Assessment |
| BOD | Basis of Design |
| C&R | Containment & recovery |
| CASA | Civil Aviation Safety Authority |
| CASR | Civil Aviation Safety Regulation |
| CG | Core Group |
| DAWE | Department of Agriculture, Water and the Environment (Cwlth) |
| DBCA | Department of Biodiversity, Conservation and Attractions (Cwlth) |
| DoT | Department of Transport (WA) |
| EEZ | Exclusive Economic Zone |
| EP | Environment Plan |
| EPBC | Environment protection and biodiversity conservation |
| EPO | Environmental Performance Outcome |
| EPS | Environmental Performance Standard |
| ERT | Emergency Response Team |
| ESTB | Electronic surface tracker buoys |
| FCA | Field Capability Assessment |
| FOB | Forward operational base |
| FPSO | Floating production storage and offloading facility |
| ft | Foot |
| FWAD | Fixed wing aerial dispersant |
| g | Gram |
| GPS | Global positioning system |
| HSE | Health, Safety and Environment |
| IAP | Incident Action Plan |
| IBC | Intermediate bulk container |
| ICAO | International Civil Aviation Organization |
| IMT | Incident Management Team |
| IOGP | International Association of Oil & Gas Producers |
| IPIECA | International Petroleum Industry Environmental Conservation Association |
| IT | Information Technology |
| km | Kilometre |
| MDO | Marine diesel oil |
| mm | Millimetre |
| MODU | Mobile offshore unit |
| MSRC | Marine Spill Response Corporation |
| N/A | Not applicable |
| SIMA | Net Environmental Benefit Analysis |
| nm | nautical mile |
| NatPlan | National Plan for Maritime Environmental Emergencies |
| NEBA | Net environmental benefit analysis |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority (Cwlth) |
| NRT | National response team |
| NWMR | North West Marine Region |
| OPEP | Oil Pollution Emergency Plan |
| OPGSS (E) regulations | Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwlth) |
| OSCA | Oil spill control agent |
| OSCP | Oil Spill Contingency Plan |
| OSMBIP | BHP Operational Scientific Monitoring Bridging Implementation Plan |
| OSM | Operational and scientific monitoring |
| OSRO | Oil Spill Response Organisation |
| OSRL | Oil Spill Response Limited |
| OSTM | oil spill trajectory modelling |
| OWR | Oiled wildlife response |
| ppb | Parts per billion |
| PPE | Personal protective equipment |
| P&D | Protection and deflection |
| ROV | Remotely operated vehicle |
| RS | Response Plan |
| RTM | Response time model |
| SAR | Search and rescue |
| SCAT | Shoreline clean-up assessment technique |
| SCS | Source Control Section |
| SCERP | BHP Source Control Emergency Response Plan |
| SFRT | Subsea first response toolkit |
| SIMA | Spill Impact Mitigation Assessment |
| SIRT | Subsea incident response toolkit |
| SMPEP | Shipboard marine pollution emergency plan |
| SMV | Surveillance, monitoring and visualisation |
| SOPEP | Shipboard oil pollution emergency plan |

| | |
|---|---|
| **SSDI** | Sub-sea dispersant injection |
| **µm** | Micrometre |
| **VOC** | Volatile organic compound |
| **WA** | Western Australia |
| **WCD** | Worst-case discharge |
| **%** | Percent |

# 1 Introduction

## 1.1 Purpose

This BHP Petroleum (Australia) Pty Ltd (BHP) Pyrenees Phase 4 Oil Pollution Emergency Plan (OPEP): Basis of Design and Field Capability Assessment provides a detailed evaluation of response need based upon appropriate response strategies for the identified worst-case discharge (WCD) scenarios. It provides:

1. a summary of BHP’s Phase 4 Infill Drilling activity in the Pyrenees Field;
2. a summary of the WCD scenarios which could occur as a result of petroleum activities;
3. stochastic and deterministic modelling outputs for selected WCD scenarios to inform the field capability assessment;
4. the Spill Impact Mitigation Assessments (SIMAs) to inform response strategy selection;
5. an environmental impact and risk evaluation for the implementation of each selected response strategy;
6. an evaluation of response need based upon WCD scenarios for each suitable response strategy to inform field response planning and provide the detailed oil spill response field capability analysis;
7. an evaluation of response capability to implement each suitable response strategy (inclusive of source control) in an effective and timely manner, including an assessment of personnel, equipment, procedures both internal to BHP and from State and National resources and oil spill response organisations (OSROs);
8. detail of response timings for each response strategy including detailed response time models (RTMs) for source control strategies;
9. spill response logistical arrangements;
10. a detailed ALARP evaluation for each response strategy to demonstrate all reasonable and practicable response capability in available to implement a timely response; and
11. Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria for response preparedness.

This process is consistent with the oil spill response planning processes defined in IPIECA-IOGP (2013) Oil spill risk assessment and response planning for offshore installations.

This document has been adapted from work undertaken jointly by the APPEA Oil Spill Working Group and presented within the *Inpex Australia – Browse Regional Oil Pollution Emergency Plan – Basis of Design and Field Capability Assessment Report* (X060-AH-REP-70016) (Inpex, 2021). BHP specifically wish to acknowledge the contribution made by Inpex Australia for the development of a draft framework for regional oil pollution response planning.

## 1.2 Scope / Inclusions and Exclusions

This document describes oil spill preparedness arrangements for the effective and timely response to potential WCD scenarios for BHP's Pyrenees Phase 4 Infill Drilling Program, inclusive of source control arrangements associated with a potential LOWC scenario.

This document does not include the following:

- a detailed activity description (refer to EP)
- description and risk assessment of oil spills on environmental values and sensitivities (refer to the *Pyrenees Phase 4 Infill Drilling Program Environment Plan* (BHPB-04PY-N950-0021)
- evaluation of controls to prevent oil pollution from the described activity and associated EPOs / EPSs and measurement criteria (refer to the *Pyrenees Phase 4 Infill Drilling Program Environment Plan* (BHPB-04PY-N950-0021)
- operational and scientific monitoring programs (refer to *Pyrenees Field: Operational and Scientific Monitoring Bridging Implementation Plan* (BHPB-04PY-N950-0023)
- vessel-based spill response (refer to vessel-specific SOPEP / SMPEP)
- detailed source control planning (refer to APU Source Control Emergency Response Plan (SCERP))

# 2 BHP Pyrenees Phase 4 Infill Drilling Program Overview

BHP Petroleum (Australia) Pty Ltd (BHP) proposes to undertake infill development drilling activities at up to three existing well locations at two well centres (Crosby South and Stickle) within production licence area WA-42-L in Commonwealth waters, which forms part of the Pyrenees Development (Figure 2-1).

The location coordinates of the Crosby-3H1, Crosby-4H2 and Stickle-4H1 well centres are provided in Table 2-1. The closest landfall is the North West Cape peninsula, Exmouth, approximately 27 km to the south-east. The proposed activities are located approximately 13 km outside the northern boundary of the Ningaloo Marine Park. The water depth in the operational area is approximately 200 m, with all wells located in approximately 197 m.

**Table 2-1: Location coordinates for petroleum activity**

| Well Centre | Approx. Water Depth (m) | Latitude | Longitude | Production Licence |
|---|---|---|---|---|
| Crosby-3H1 | 197 m | 21° 32' 43.063" S | 114° 05' 42.504" E | WA-42-L |
| Crosby-4H2 | 197 m | 21° 32' 42.00" S | 114° 05' 40.468" E | WA-42-L |
| Stickle-4H1 | 197 m | 21° 31' 23.679" S | 114° 06' 35.289" E | WA-42-L |

A detailed description of the activity is provided in the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021).

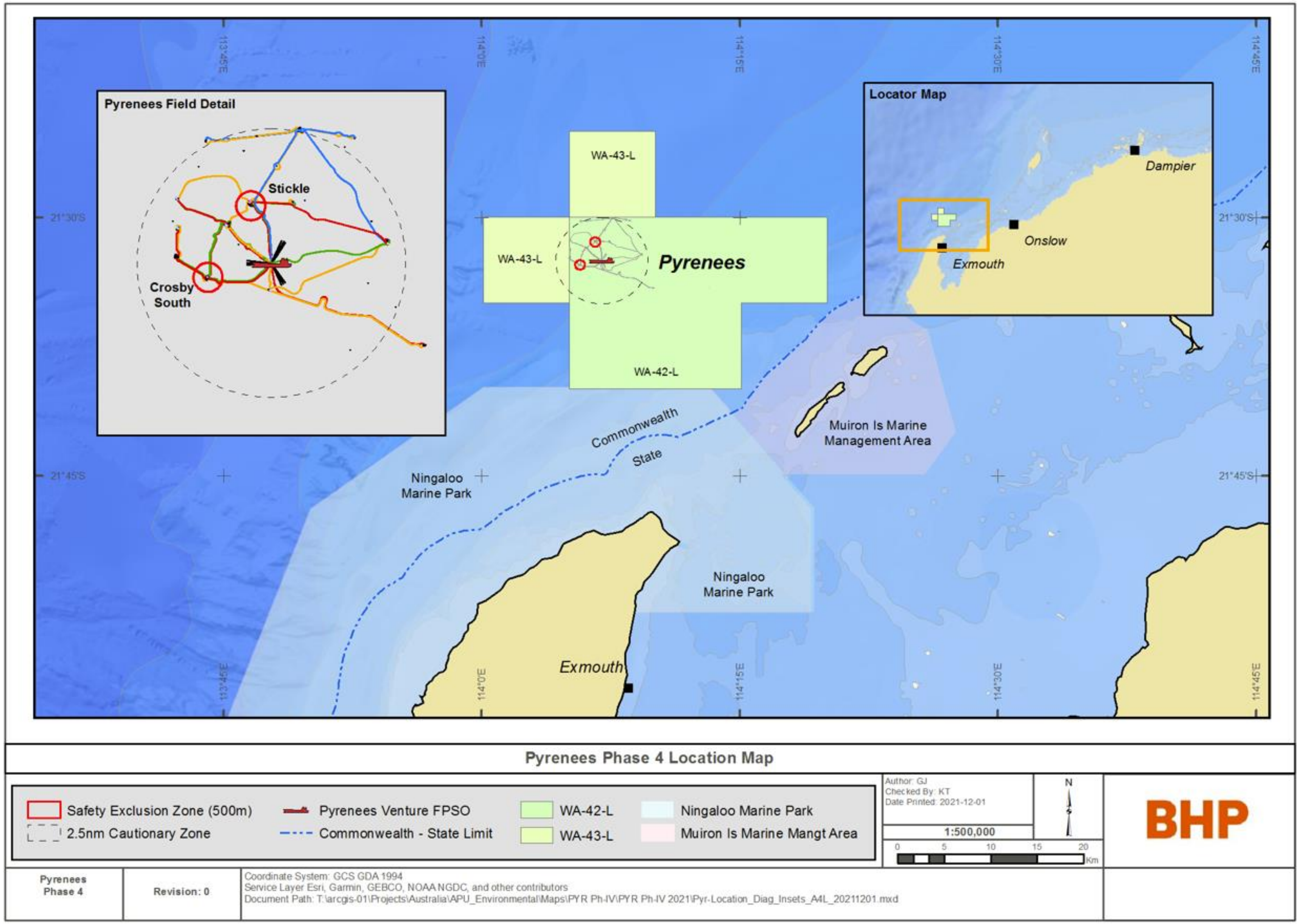



**Figure 2-1: Crosby and Stickle location map**

# 3 Worst Case Discharge Scenarios

## 3.1 Scenario Context

Unplanned events could occur during the infill drilling activities, resulting in the potential for large-scale release of hydrocarbons (i.e., incidents or emergencies). Worst-case discharge (WCD) scenarios were identified through the environmental impact and risk assessment process and a series of workshops. The following scenarios were identified:

- Subsea release of crude oil from the Stickle-4H1 production well loss of containment
- Subsea release of crude oil from a flowline resulting from a dropped object
- Surface release of marine diesel oil (MDO) from a vessel collision.

Table 3-1 presents the worst-case hydrocarbon spill scenarios identified. Each of these scenarios is discussed further in this Section, along with non-credible scenarios that were discounted.

**Table 3-1: Summary of worst-case hydrocarbon spill scenarios**

| Scenario | Hydrocarbon Type | Worst-case Maximum Spill Volume | Comment | Oil Spill Modelling? |
|---|---|---|---|---|
| Subsea release of crude oil from a loss of containment from the Stickle-4H1 well. | Stickle crude | Crude: 0.986 MMbbl ($156,774 m^3$) and Gas: 192.5 MMscf; over 69 days | Maximum credible volume modelled with highest flow LOWC with both horizontal laterals (L1 and L2) completed with screens and open to flow | Yes |
| Subsea release of crude oil from Crosby or Stickle subsea flowline due to rupture from dropped object or anchor drag. | Crosby crude | ~77 $m^3$ over 1 hour | Maximum credible volume based on loss of inventory of flowline with >90% water-cut | No |
| | Stickle Crude | ~18 $m^3$ over 1 hour | | |
| Surface release of MDO from fuel tank rupture on AHTS vessel due to collision at the Crosby South Drill Centre | Marine diesel oil | 330 $m^3$ over 6 hours | Maximum credible volume based on largest fuel tank capacity on AHTS vessel. | Yes |

## 3.2 Loss of Containment – Crude Oil

***Loss of Well Control***

BHP have calculated the worst-case discharge (WCD) for a LOWC event consistent with the methodology applied within the *SPE Technical Report; Calculation of Worst-Case Discharge (WCD), Rev 1 2016 (Society of Petroleum Engineers, 2015)*. Reservoir modelling was undertaken for both Crosby and Stickle formations to determine the WCD for the Pyrenees Phase 4 infill drilling program.

Modelling has demonstrated that the Crosby-3H1 well cannot sustain flow with both laterals open (i.e., prior to installation of the plug). This is because at expected reservoir conditions (pressure, water cut), the lower lateral (L1) is unable to flow against the hydrostatic backpressure without gas lift. The higher pressure L1 overpressures the upper lateral (L2), such that with both laterals open, the well is unable to flow due to the high hydrostatic back pressure in the well. The upper lateral (L2) intersects a marginally lower pressure part of the reservoir, with significantly lower water content, which results in a lower hydrostatic backpressure, and capacity to flow without gas lift.

Considerations in using Stickle-4H1 dual lateral rather than Crosby-4H2 single lateral for determining worst-case discharge volumes and rates includes: the greater reservoir exposure at Stickle-4H1 compared with Crosby-4H2, and the intersection of unpenetrated fault blocks and the possible presence of a gas cap at Stickle-4H1 compared with the interpreted swept sections at the Crosby-4H2 heel reducing the amount of exposed hydrocarbons.

Reservoir modelling of the Stickle-4H1 assumed the failure of all well barriers and both horizontal laterals (L1 and L2) completed with screens and open to flow. Whilst a highly unlikely scenario, the WCD has been based upon this open-hole flow rate via an 18 ¾" subsea release orifice for the full duration (69 days) of a potential LOWC scenario. Reservoir modelling indicates that open-hole flow rates of Stickle crude oil would likely decrease from approximately 26,000 bbl/day down to approximately 8,300 bbl/day until a dynamic well kill operation could be achieved.

Based upon the detailed reservoir modelling, the total volume of Stickle crude that may be expected over a 69-day LOWC scenario in the Pyrenees Field equates to approximately 1 MMbbl.

***Loss of Containment – Flowline Inventory***

During the activity, the MODU will be operating in the proximity of operationally active subsea infrastructure. Consequently, there is the potential for loss of inventory from single or multiple flowlines resulting in a subsea release of hydrocarbons (crude oil). A release of crude oil from subsea infrastructure may be caused by a dropped object or a loss of mooring resulting in anchor drag.

A review of the subsea infrastructure in the operational area identified the following WCD scenarios caused by a dropped object:

- Crosby-3H1: 176 $m^3$ from 10" Line 'A' rounded up to ~200 $m^3$ to allow for emergency shut-down time lag
- Stickle-4H1: 1.915 $m^3$ from 6" production jumper 'PJ3' or 'PJ4' rounded up to ~2 $m^3$.

Both scenarios have >90% water-cut and therefore WCD is ~20 $m^3$ and ~0.2 $m^3$ crude release respectively.

The worst-case subsea crude release from a dropped object is defined as a loss of the entire inventory of the 10" Crosby production flowline 'Line A' (~20 $m^3$ crude). This scenario is an instantaneous release based on complete severing of the flowline and assumes that only the inventory of the flowline and riser would be released due to activation of the isolation at the Ravensworth 2 manifold.

An analysis of subsea infrastructure in areas surrounding the MODU mooring locations identified the following WCD scenarios caused by a loss of mooring:

- Crosby-3H1: anchor drag on N.E. vector intersecting (and simultaneously rupturing) production flowlines A, C, D, E, G, F, I, J, & W culminating in a ~773 $m^3$ subsea release
- Stickle-4H1: anchor drag on N.E. vector intersecting (and simultaneously rupturing) production flowlines F, J, & W culminating in a ~178 $m^3$ subsea release.

Both scenarios have >90% water-cut and therefore WCD is ~77 $m^3$ and ~18 $m^3$ crude release respectively.

The analysis of a potential subsea release caused by anchor drag is considered highly conservative given each scenario considers the simultaneous rupture of all flowlines within the path of potential anchor drag, which is exceedingly unlikely.

## 3.3 Loss of Containment – MDO

***Vessel Collision***

During the activity, the physical presence of the MODU and AHTS vessels within the operational area presents a vessel to vessel and vessel to MODU collision risk, consistent with the *Technical guideline for preparing contingency plans for Marine and Coastal Facilities, Commonwealth of Australia 2015.*

The worst-case scenario MDO spill has been based on the release of the full volume of the largest fuel oil tank of an AHTS vessel due to vessel collision and subsequent release to the marine environment. A vessel collision could occur due to poor weather, human error or vessel navigation/equipment failure. Based on a review of the specifications for probable AHTS vessels suitable for supporting the activity, the worst-case maximum credible volume of MDO that could be released to the marine environment is conservatively estimated to be 330 $m^3$.

# 4 Spill Modelling Overview

This section presents the details and a summary of outputs of oil spill modelling which has been undertaken to inform Basis of Design for spill response planning presented in Section 6. Full details are provided within Pyrenees Phase 4 Oil Spill Modelling Report. 12549974-REP (GHD, 2021).

## 4.1 Probabilistic (Stochastic) Modelling Methodology and Inputs

Spill modelling was carried out using SINTEF's Oil Spill Contingency and Response (OSCAR) System (Version 11.0.1). OSCAR is a system of integrated models that quantitatively assess the fate and transport of hydrocarbons in the marine environment, as well as evaluate the efficacy of response measures (Reed *et al*., 2001; Reed *et al*., 2004).

OSCAR provides an integrated hydrocarbon transport and weathering model that accounts for hydrocarbon advection, dispersion, surface spreading, entrainment, dissolution, biodegradation, emulsification, volatilisation and shoreline interaction.

Three-dimensional (3D) OSCAR modelling was undertaken in stochastic mode (total of 150 realisations per scenario) with start dates spaced approximately fortnightly over a five-year period. Inputs into the model were sourced from HYCOM (regional ocean currents, temperature and salinity profiles), TPXO7.2 (tidal currents) and NCEP/NCAR (regional winds).

OSCAR enables simulation of a hydrocarbon release scenario in deterministic mode (i.e., a scenario is simulated with one start date with spatial results available at fixed time intervals over the duration of the simulation) or stochastic mode (i.e., a scenario is simulated a number of times with varying start dates, and the results are outputted spatially in a probabilistic manner).

Table 4-1 provides the details on the model input specifications for the modelled scenarios.

**Table 4-1: Model input specifications**

| Parameter | Subsea Crude Spill (loss of well control) | Surface MDO Spill |
|---|---|---|
| Location | Stickle well at:<br>Latitude 21° 31' 23.679" S (21.523244° S)<br>Longitude 114° 06' 35.289" E (114.109803° E) | Crosby well at :<br>Latitude 21° 32' 43.063" S<br>Longitude114° 05' 42.504" E |
| Depth of spill (m) | 182.5 | Sea surface |
| Total depth at location (m) | 199 | 199 |
| Hydrocarbon type | Stickle crude oil | Marine diesel oil |
| Liquid release volume | 156,774 $m^3$ (0.97 MMbbl) | 330 $m^3$ |
| Liquid release rate (ave.) | 13,886 STB/d (2,207 $m^3$/day) | - |
| Gas release volume | 192.5 MMscf (5,450,993 $sm^3$) | - |
| Gas release rate (ave.) | 2.71 MMscf/day | - |
| Release duration | 69 days | Instantaneous |
| Number of realisations (runs) | 150 | |
| Timing of release risk period | All months | |

## 4.2 Response Strategy Planning Thresholds

Spill model outputs can be utilised to inform spill response strategy planning. Whilst IPIECA-IOGP (2013) does not provide any specific response strategy planning thresholds, several suitable thresholds have been identified and utilised in oil spill planning within the Australian upstream petroleum industry for several years.

The thresholds assist with WCD response strategy planning, by either providing an indication of the minimum timeframe that should be planned for the activation of a certain response strategy, or the size/tier of field capability required for a certain response strategy.

Table 4-2 presents a literature review of various response strategy planning thresholds and discusses how each threshold can be used to inform response strategy planning.

Note, the response planning thresholds presented are not the actual response strategy activation triggers, which would be used in an actual oil spill event by the IMT. The response strategy planning thresholds are utilised during the development of the BOD, presented in Table 4-2 and this information is then used to inform the field capability assessments presented in Section 7.

Response strategy activation triggers to be utilised as decision-making tools by an IMT during a real spill event are detailed in the *Pyrenees Phase 4 Infill Drilling Program OPEP* (BHPB-04PY-N950-0022).

The thresholds used to evaluate the environmental risk associated with an oil spill event are defined within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021).

**Table 4-2: Response strategy planning thresholds**

| Response Strategy Planning Threshold | Response Strategy Planning Considerations | Reference/Justification |
|---|---|---|
| Max. lineal distance (km) of floating oil >1 g/m² (>1 µm) | Used to inform response planning regarding the:<br>• maximum range of surveillance, monitoring and visualisation (SMV) (e.g., aerial surveillance, satellite imagery)<br>(Note, this floating oil threshold and entrained/dissolved thresholds can also be used to inform the potential extent of Operational and Scientific Monitoring programs, however these parameters are not primary consideration for OSMP capability planning). | The Bonn Agreement Oil Appearance Code (BAOAC) is a series of five categories or 'codes' that describe the relationship between the appearances of oil on the sea surface to the thickness of the oil layer. Bonn-Code 1 refers to silver/grey sheens of floating oil and Bonn Code 2 includes rainbow sheen (thickness of 0.0003 mm to 0.005 mm, or 0.3 /m² to 5 g/m²). 1 g/m² is therefore at the lower end of Bonn Code 2.<br>Therefore, >1 g/m² has been selected as an appropriate minimum thickness to be used during oil spill modelling, to inform the geographic area which may potentially be impacted by oil, causing effects to socio-economic values, and at which water quality within a marine protected area may have been altered (NOPSEMA, 2019).<br>Therefore, during WCD response planning, aerial/satellite surveillance capability/arrangements should be evaluated against this threshold. |
| Area (km²) with floating oil >50 g/m² (>50 µm) | Used to inform response planning regarding the:<br>• geographic area in which to undertake surface chemical dispersant (aerial/vessel)<br>• geographic area in which to undertake containment & recovery (C&R) (booms and skimmers)<br>• geographic area in which to undertake in-situ burning.<br>• note: emulsification and changes in viscosity are factors potentially limiting the effectiveness of C&R, and more significantly, changes in viscosity and/or emulsification can reduce dispersant effectiveness. Therefore, consideration of these factors may be required during evaluation of modelling outcomes for response planning. | Oil needs to be >100 g/m² (>0.1mm, which equates to Bonn Code 4/5) to feasibly corral oil with a boom and achieve any significant level, or operationally efficient level, of oil recovery with skimmers during an offshore C&R operation (O'Brien, 2002; IPIECA-IOGP, 2015a). In addition, as the capture/containment and corralling of oil with booms is required for in-situ burning, this threshold is considered appropriate for that response strategy.<br>IPIECA-IOGP (2015b) and the National Research Council (2005) state that oil slicks need to be >100 g/m² (>0.1 mm, which equates to Bonn Code 4/5) to feasibly achieve a successfully dispersant operation.<br>Whilst 100 g/m² may be the threshold for on water response strategy effectiveness stated in the literature, when evaluating oil spill modelling outputs, a lower response strategy planning threshold is considered appropriate.<br>The effects of winds, currents etc. cause oil to spread, and it often forms into windrows with a range of oil thicknesses across a given area. During oil spill modelling, the oil thickness within a grid-cell is averaged. Therefore, for a grid-cell reporting an average thickness of 50 g/m², there will be range of thicknesses, due to oil behaviour, including patches/windrows/streamers of oil, of which some will be >100 g/m².<br>50 g/m² is aligned with the recommendation of NOPSEMA (2019). |

| Response Strategy Planning Threshold | Response Strategy Planning Considerations | Reference/Justification |
|---|---|---|
| | • note: this threshold is not relevant for protection of sensitive resources response strategy. This response strategy typically uses booms to deflect/corral oil, the same as at sea containment and recovery. However, unlike at sea containment and recovery (which requires >100 g/m$^2$ floating oil thickness for operational efficiency), when conducting protection of sensitive resources, nearshore protection booms can be effective at deflecting low concentrations of floating oil, over a long duration, to prevent long-term accumulation of oil in a sensitive receptor. Therefore, there is no specified response planning threshold defined for the protection of sensitive resources response strategy.<br>• note: whilst this threshold is relevant for surface dispersant application, it is not relevant for subsea dispersant injection (SSDI). Planning for SSDI should be based on consideration of the reservoir oil properties, flow rates, and the effectiveness of selected dispersants on the oil type. | Therefore, during WCD response planning, on water response strategies including C&R, surface dispersant application and in-situ burning capability and arrangements should be evaluated against this threshold. |
| Longest length (km) or number of segments of shoreline oiled >10 g/m$^2$ | Used to inform response planning regarding the:<br>• number of segments, and tier/size of shoreline clean-up assessment technique (SCAT) teams, including oiled wildlife response (OWR) and protection of sensitive resources assessments. | IPIECA-IOGP (2015c) classifies oil on shorelines based on oil thickness. Stain is classified as <0.1mm (100g/m$^2$), and film as 'iridescent sheen', i.e., less than stain, with no minimum thickness. If a film were considered an order of magnitude lower than stain, the thickness would be 0.01 mm (10 g/m$^2$). For comparative purposes, 0.01 mm thickness is equivalent to ~2 teaspoons oil/m$^2$.<br>Oil is just visible at this thickness on a shoreline and there is potential for some socio-economic impacts at this thickness. Therefore, 0.01mm (10 g/m$^2$) is considered an appropriate threshold to understand the potential length of shoreline/number of shoreline sectors for which SCAT may be required.<br>This is aligned with the recommendation of NOPSEMA (2019).<br>Therefore, during WCD response planning, SCAT capability and arrangements should be evaluated against this threshold. |
| Minimum time to shoreline contact for oil >10 g/m$^2$ | Used to inform response planning regarding the:<br>• timeline for mobilisation of SCAT, OWR and P&D assessment teams. | Understanding the shortest possible timeline between the spill event, and oil arriving on a shoreline at >10 g/m$^2$ provides a metric to consider, for the arrangements required for the mobilisation of a SCAT capability. |

| Response Strategy Planning Threshold | Response Strategy Planning Considerations | Reference/Justification |
|---|---|---|
| Longest length (km) or number of segments of shoreline oiled >100 g/m$^2$ | Used to inform response planning regarding number of segments, and tier/size of:<br>• shoreline clean-up<br>• OWR<br>• protection of sensitive resources (or protect and deflect/P&D) | 100 g/m$^2$ is often used as minimum thickness for effective shoreline clean-up (Owens and Sergy, 2000), and French-McCay (2009) conclude that 100 g/m$^2$ is the minimum oil thickness for effects on marine fauna and invertebrates on a shoreline.<br>This is aligned with the recommendation of NOPSEMA (2019).<br>Therefore, during WCD response planning, shoreline clean-up, P&D and OWR capability and arrangements should be evaluated against this threshold. |
| Minimum time to shoreline contact for oil >100 g/m$^2$ | Used to inform response planning regarding:<br>• timeline for mobilisation of shoreline clean-up, OWR, P&D and waste management capabilities. | Understanding the shortest possible timeline between the spill event, and oil arriving on a shoreline at >100 g/m$^2$ provides a metric to consider, for the arrangements required for the mobilisation of a shoreline clean-up/OWR capability, and associated waste management capability that will be required by these response strategies. |
| Highest peak shoreline loading above moderate threshold (100 g/m$^2$) | Used to inform response planning regarding the:<br>• volume of waste likely to be generated during P&D, OWR and shoreline clean-up. | 100 g/m$^2$ often used as minimum thickness for effective shoreline clean-up (Owens and Sergy, 2000; French-McCay, 2009) conclude that 100 g/m$^2$ is the minimum oil thickness for effects on marine fauna and invertebrates on a shoreline, and therefore triggers potential for OWR cleaning operations and associated waste generation.<br>Therefore, during WCD response planning, the volume of oily waste potentially generated during shoreline clean-up, P&D and OWR and the associated waste management capability and arrangements should be evaluated against this threshold. |

## 4.3 Spill Modelling Results and Basis of Design

This section presents the outputs of the WCD modelling runs against the most relevant response planning thresholds described in Table 4-2. The spill model outputs, assessed against response planning thresholds, has been termed the ‘Basis of Design’ (BOD). The BOD tables are used to inform the Field Capability Assessments presented in Section 7.

Stochastic LOWC realisations were selected on the basis of the following criteria for detailed deterministic modelling:

- Highest accumulated shoreline loading of oil at the high sensitivity area of the Ningaloo Region above the moderate threshold of 100 $g/m^2$
- Highest accumulated shoreline loading of oil on all shorelines (i.e., all locations) above 100 $g/m^2$
- Minimum arrival time of oil to any shoreline above the moderate threshold of 100 $g/m^2$
- Maximum daily surface oil area ($km^2$) of surface oil thickness above 50 $g/m^2$ (>50 µm)

The selected crude oil LOWC stochastic realisations are summarised in Table 4-3 and Table 4-4 and are represented visually in Figure 4-1 and Figure 4-2.

A summary of extant of a worst-case MDO surface release is presented in Table 4-5 and depicted in Figure 4-3.

**Table 4-3: Deterministic results for peak mass oil ashore (GHD, 2021)**

| Spill Scenario | Modelling Realisation | Start of Release | Planning Threshold | Peak Mass Oil Ashore (unmitigated) | Mitigation Options Simulated | Peak Mass Oil Ashore (mitigated) | Net Result of Mitigation |
|---|---|---|---|---|---|---|---|
| LOWC 69-day release | 1 | January | Highest accumulated shoreline loading at Ningaloo Region above moderate threshold (100 g/m$^2$) | 11,050 tonnes peak loading occurred during day 28 | Source Control | 10,976 tonnes occurring during day 28 | Net decrease in loading |
| | | | | | Subsea dispersant injection (SSDI) | 12,799 tonnes occurring during day 29 | Net increase in loading |
| | | | | | Surface dispersant application (SDA) | 6,241 tonnes occurring during day 29 | Net decrease in loading |
| | | | | | Source Control + SSDI + SDA | 5,816 tonnes occurring during day 23 | Net decrease in loading |
| | 98 | January | Highest accumulated shoreline loading above moderate threshold (100 g/m$^2$) across all shorelines. | 11,485 tonnes peak loading occurred during day 74 | Source Control | 5,584 tonnes occurring during day 38 | Net decrease in loading |
| | | | | | SSDI | 12,320 tonnes occurring during day 74 | Net increase in loading |
| | | | | | SDA | 3,782 tonnes occurring during day 46 | Net decrease in loading |
| | | | | | Source Control + SSDI + SDA | 3,178 tonnes occurring during day 21 | Net decrease in loading |
| *Modelling indicates that the greatest potential for shoreline loading occurs during summer months from December to February.* | | | | | | | |

**Table 4-4: Minimum arrival time to any shoreline and maximum daily surface area (GHD, 2021)**

| Spill Scenario | Modelling Realisation | Start of Release | Planning Threshold | Modelling Result |
|---|---|---|---|---|
| LOWC 69-day release | 94 | December | Minimum arrival time of oil to any shoreline above moderate threshold (100 g/m$^2$) of | 0.9 days at Muiron Islands and 2.6 days at Onslow Region |
| | 10 | April | Maximum daily surface oil area (km$^2$) of surface oil thickness >50 g/m$^2$ . | 149.8 km$^2$ of on day 13 of the LOWC event. The simulation for the maximum case indicates surface oil moving in a westerly direction away from the Western Australian mainland |
| *Modelling indicates that the greatest potential for shoreline loading occurs during summer months from December to February.* | | | | |

**Table 4-5: Summary of worst-case MDO exposure (GHD, 2021)**

| Spill Scenario | Potential Extent of Hydrocarbon Exposure |
|---|---|
| MDO - surface release (6-hour) | Highest accumulated shoreline loading* at Ningaloo Region above moderate threshold (100 g/m$^2$) of **202 tonnes**. |
| | Highest accumulated shoreline mass* above moderate threshold (100 g/m$^2$) of **202 tonnes across all shorelines.** |
| | Minimum arrival time of oil to any shoreline above the moderate threshold (100 g/m$^2$) of **0.7 days at Ningaloo Region**. |

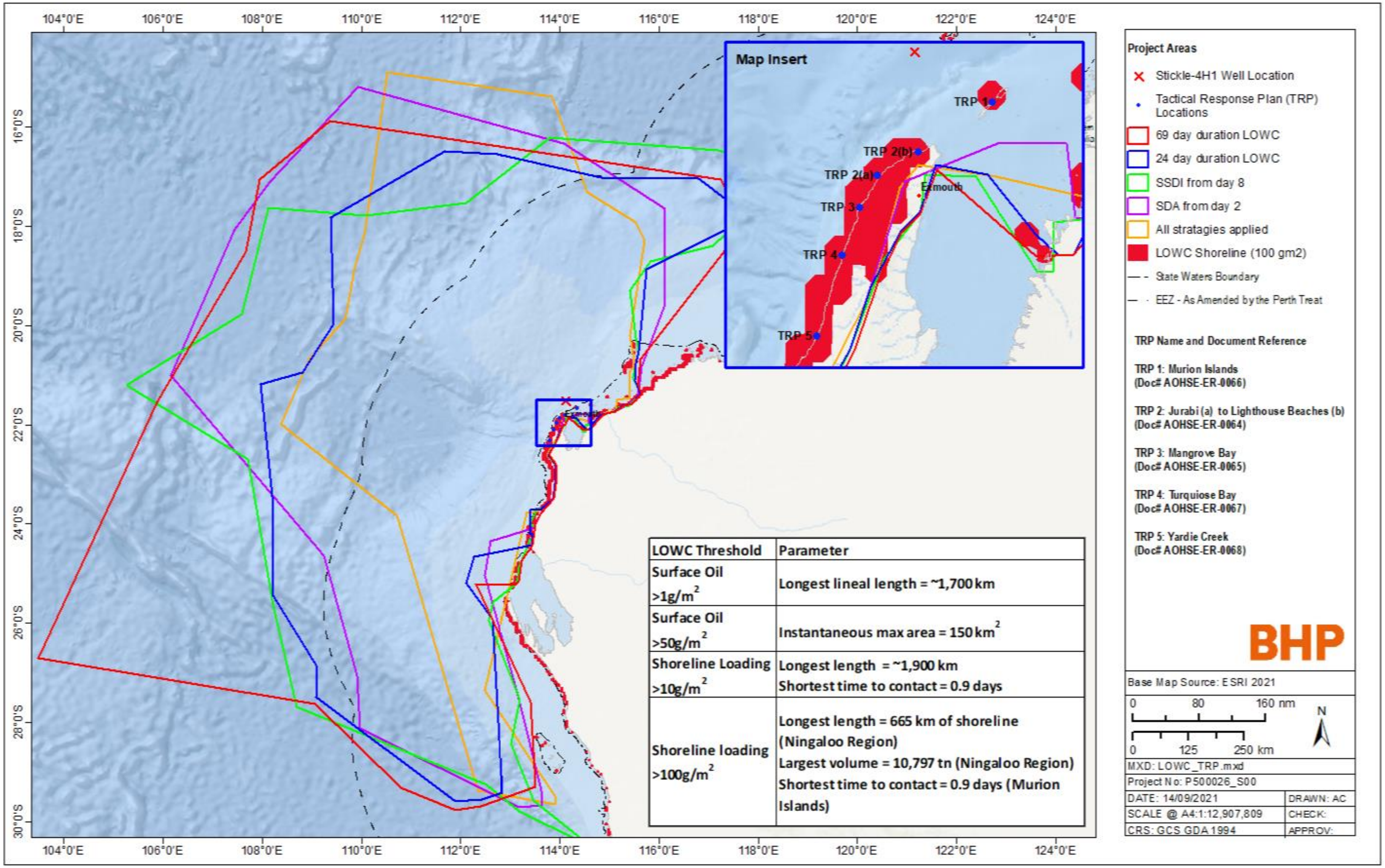
*Oil on shorelines is tracked by OSCAR as an accumulated value for the stochastic simulations. The calculation for accumulated oil is the sum of all oil that has arrived at a shoreline cell over the duration of the simulation. In this manner, it does not consider weathering losses due to evaporation or washing of the shoreline by waves. The accumulated value will therefore be a conservative over-estimate of the peak oil mass at a shoreline when compared to the deterministic prediction, which does consider these loss mechanisms.

## 4.4 Description of Operating Environment

A detailed description of the existing environment, including full EPBC Protected Matters Search outputs and literature review of the values and sensitivities potentially impacted by oil spills are contained within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021).

To provide context for spill response planning purposes, a high-level summary of the environmental values and sensitivities of the region is provided below.

- Deep offshore waters (Pyrenees Field ~200 m water depth)
    - Typically, nutrient poor, supporting pelagic fish, sharks, cetaceans etc., and marine avifauna
    - Some demersal fisheries
    - Some offshore oil and gas developments
- Ningaloo Coast (World Heritage Area) (approx. 22 km ESE from Pyrenees Field)
- Offshore submerged banks and shoals
    - typically, coral/coralline algae dominated substrates, supporting diverse shallow water reef ecosystems, including aggregation/feeding areas for marine megafauna
- Offshore emergent reefs/islands
    - typically, coral/coralline algae dominated substrates, supporting diverse shallow water reef ecosystems, including aggregation/feeding areas for marine megafauna
    - coarse sandy beaches, some with limited vegetation
    - most offshore islands typically supporting protected marine fauna (turtle/bird) roosting/breeding/nesting.
- NW WA coastline – outer islands
    - tidal, typically moderate wave energy rocky shorelines or coarse sandy beaches, with highly diverse fringing coral reef ecosystems
    - some beaches supporting protected marine fauna (turtle/bird) roosting/breeding/nesting, and occasional presence of estuarine crocodiles.
- NW WA coastline – inshore islands/mainland coast
    - tidal, typically moderate to low energy shorelines, dominated by beaches medium to fine-grain beaches and some mangrove habitats, with some rocky outcrops.
    - beach and mangrove habitats support diverse ecosystems.




| LOWC Threshold | Parameter |
|---|---|
| Surface Oil >1g/m$^2$ | Longest lineal length = ~1,700 km |
| Surface Oil >50g/m$^2$ | Instantaneous max area = 150 km$^2$ |
| Shoreline Loading >10g/m$^2$ | Longest length = ~1,900 km<br>Shortest time to contact = 0.9 days |
| Shoreline loading >100g/m$^2$ | Longest length = 665 km of shoreline (Ningaloo Region)<br>Largest volume = 10,797 tn (Ningaloo Region)<br>Shortest time to contact = 0.9 days (Murion Islands) |

**Figure 4-1: LOWC crude WCD modelling results (unmitigated & mitigated)**

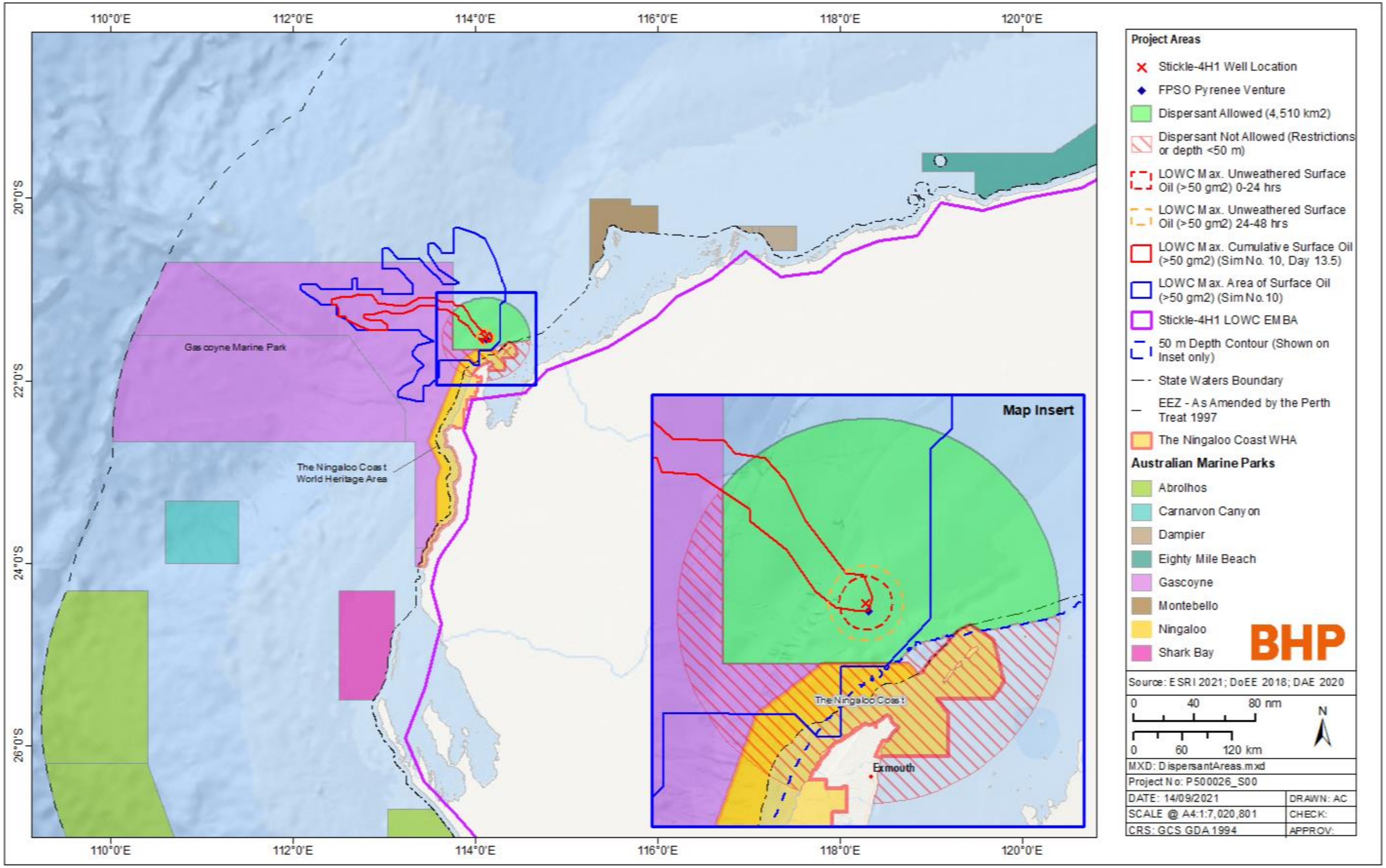
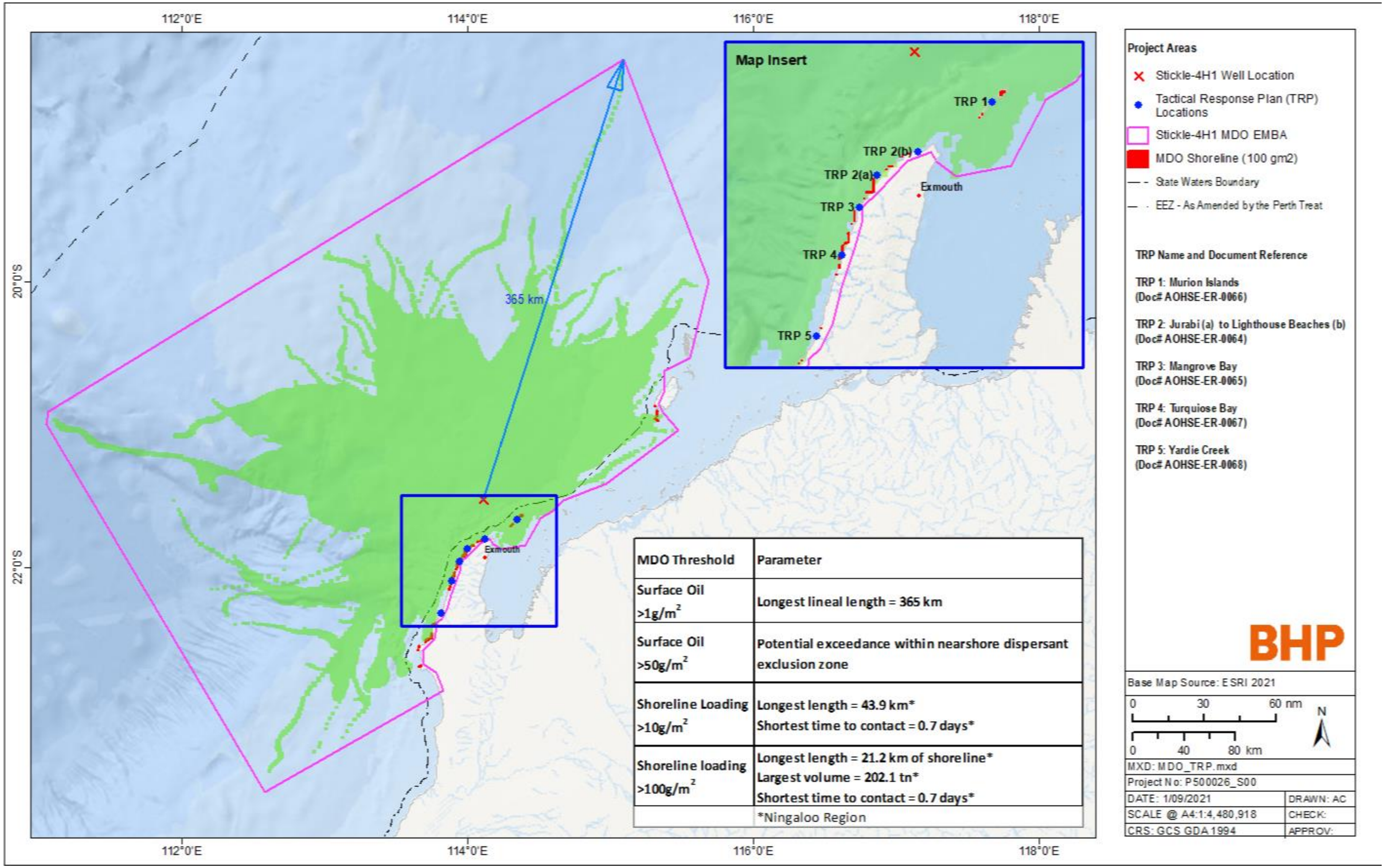



**Figure 4-2: LOWC crude maximum daily surface oil area (km²) of surface oil thickness >50 µm**




| MDO Threshold | Parameter |
|---|---|
| Surface Oil >1g/m$^2$ | Longest lineal length = 365 km |
| Surface Oil >50g/m$^2$ | Potential exceedance within nearshore dispersant exclusion zone |
| Shoreline Loading >10g/m$^2$ | Longest length = 43.9 km*<br>Shortest time to contact = 0.7 days* |
| Shoreline loading >100g/m$^2$ | Longest length = 21.2 km of shoreline*<br>Largest volume = 202.1 tn*<br>Shortest time to contact = 0.7 days* |
| | *Ningaloo Region |

**Figure 4-3: MDO WCD modelling results**

# 5 Spill Impact Mitigation Assessment

## 5.1 Spill Impact Mitigation Assessment

BHP has developed a Spill Impact Mitigation Assessment (SIMA) process for the WCD scenarios relevant to BHP's Phase 4 activities in the Pyrenees Field.

The SIMA considers:

- Level 3: Loss of well control with subsurface release of 156,774 $m^3$ of crude oil over 69-days;
- Level 2: Loss of flowline inventory with subsurface release of ~77 $m^3$ of crude oil; and
- Level 2: Fuel tank rupture from a vessel collision resulting in a surface release of 330 $m^3$ MDO.

The SIMA process developed by IPIECA (2017a) is a pre-spill planning tool to facilitate response option selection and support the development of the overall response strategies by identifying and comparing the potential effectiveness and impacts of oil spill response strategies. The SIMA assists in the assessment of the impact mitigation potential and in making a transparent determination of response strategies that are considered most effective at minimising oil spill impacts (IPIECA, 2017a). The framework includes environmental considerations as well as a range of shared values such as ecological, socio-economic, and cultural aspects (IPIECA, 2017a). The SIMA process described below is consistent with IPIECA.

### 5.1.1 Strategic SIMA Process

In the oil spill response planning process, BHP has adopted a comprehensive SIMA methodology to select and justify the appropriate response strategy combinations for individual WCD scenarios. A strategic SIMA was conducted to select the potential oil spill response strategies in the event of Level 2 or 3 spills (Table 5-1). The focus of the SIMA was to understand the consequences of 'no action' and to select an oil spill response strategy that delivered a net environmental benefit.

The SIMA methodology utilised is described as follows:

- LIST the response strategies available;
- IDENTIFY the benefit, environmental impact and operational challenge of each response strategy;
- EVALUATE the viability of each response strategy in a particular credible scenario;
- FILTER the result to identify all the viable strategies for a particular credible scenario;
- FORMULATE options of different strategy combinations; and
- COMPARE these options and select the preferred option of strategy combination.

From these results, the priority application ZONE of each strategy is identified in the preferred strategy combination by selecting the:

- Primary response strategy, which is confirmed to be used and should be applied as soon as possible;
- Secondary response strategy, which will be only applied if needed and practical; and
- Nil response strategy, which is a non-preferred option, will not be used and does not identify a net environmental benefit.

**Table 5-1: Strategic SIMA of response options for hydrocarbon spills**

| RS # | Spill Response Strategy | Overview of Environmental Benefits | Associated Environmental Risks/ Impacts | Operational Constraints | Apply Response | | Primary or Secondary Response | Justification Note |
|---|---|---|---|---|---|---|---|---|
| **RS1.1** | Source Control – Vessel Control | Limits and/or prevents further discharge of hydrocarbons to the marine environment by halting the spill (e.g., transfer fuel to another tank). | No significant impacts. | Health, safety & environmental considerations may delay implementation. | Level 2 – MDO | Yes | Primary | Control at the vessel will always be attempted as the immediate primary response to halt further spill to marine environment.<br>SOLAS primary objective. |
| | | | | | Level 2 – Crude (Flowline release) | N/A | - | |
| | | | | | Level 3 – Crude (Loss of well control) | N/A | - | |
| **RS1.2** | Source Control – Subsea Intervention (BOP actuation / FPSO emergency shut-down / ROV override) | Prevents further discharge of hydrocarbons to the marine environment by halting the spill. | No significant impacts. Impacts and risks from subsea intervention similar to those described for routine MODU / FPSO / vessel operations. | Health and safety considerations may delay implementation under certain circumstances (e.g., LEL's).<br>MODU operability.<br>ROV availability. | Level 2 – MDO | N/A | - | Subsea source control will always be attempted as the immediate primary response to halt further spill to marine environment for subsea releases (when safe to do so). |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS1.3** | Source Control – Relief Well | Prevents further discharge of hydrocarbons to the marine environment by halting the spill through the drilling of a relief well. | No significant impacts. Impacts and risks from MODU operations similar to those described for routine drilling operations. | Alternate MODU potentially required.<br>Hardware & consumables.<br>Associated logistics. | Level 2 – MDO | N/A | - | Relief well remains the base-case for full well containment.<br>Initiated concurrently with alternate source control options. |
| | | | | | Level 2 – Crude (Flowline release) | N/A | - | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS1.4** | Source Control – Capping Stack | Prevents further discharge of hydrocarbons to the marine environment by halting the spill.<br>Deterministic oil spill modelling (GHD, 2021) indicates source control by day 25 of the LOWC yields a significant benefit to predicted shoreline loading, reducing the peak shoreline load up to 49% compared with an unmitigated (i.e., source control at day 69) scenario. Further detail is provided within Section 6.3.1. | No significant impacts. Impacts and risks from capping stack installation similar to those described for routine vessel operations. | Health and safety considerations may delay implementation under certain circumstances (e.g., LEL's).<br>Environmental conditions influence deploy ability. | Level 2 – MDO | N/A | - | Capping stack represents temporary containment solution until relief well successfully intersect wellbore and restores full well control.<br>Initiated concurrently with alternate source control options. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | - | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS1.5** | Source Control – Subsea First Response Toolkit | Facilitates debris clearance and SSDI to enable subsequent source control operations. | No significant impacts. Impacts and risks from SFRT deployment similar to those described for routine vessel operations. See SSDI below. | Associated logistics from Fremantle / Henderson.<br>Deployment vessel. | Level 2 – MDO | N/A | - | Initiated concurrently with alternate source control options.<br>Emergency shut-down primary strategy for flowline release – SFRT may support as/if required.<br>May be required throughout source control operations. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Secondary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS2** | Monitor and Evaluate | Constant monitoring and evaluation by surveillance is a mandatory strategy required for real-time decision-making during a spill event. | Risks/ impacts from operations of monitoring vessels and aircraft (e.g., emissions such as air, noise, artificial light and liquid waste, marine fauna interaction, interference with other users, etc.). | Weather conditions may put constraints on visual observations (vessel and/or aerial).<br>Stringent safety management requirements for aerial and marine operations.<br>Potential coordination of multiple vessels/ aircraft within limited area (SIMOPS). | Level 2 – MDO | Yes | Primary | Surveillance activities ensure constant monitoring and evaluation of the spill. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS3** | Dispersant – Surface Application | At an assumed efficacy of 75% (Intertek Geotech, 2014), spill modelling (GHD, 2021) indicates the surface dispersant application (SDA) response is predicted to yield substantially environmental benefits in terms of reduced surface oil and shoreline loading. However, there are concomitant increases in entrained and dissolved oil from the SDA response. Peak shoreline loading is predicted | Discharge of dispersant into environment.<br>Adds chemical to environment when it is not likely to impact high or extreme environment receptors (exclusion zones in place).<br>Operation of aircraft and support vessel (efficacy testing).<br>No removal of crude oil from environment. | Not applicable to diesel spills due to rapid dispersion and spreading.<br>Crude oil may only be amenable to dispersion for 24 to 48 hours after release.<br>Application only effective at optimal oil thickness. | Level 2 – MDO | No | - | Applied to breakdown the hydrocarbon and allow/enhance dispersion into the water column, potentially reducing shoreline contact and increasing natural rates of biodegradation. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |

| RS # | Spill Response Strategy | Overview of Environmental Benefits | Associated Environmental Risks/ Impacts | Operational Constraints | Apply Response | | Primary or Secondary Response | Justification Note |
|---|---|---|---|---|---|---|---|---|
| | | to reduce by approximately 33% of the unmitigated load with the SDA response.<br>Further detail is provided within Section 6.3.2. | | Requires clear area / no simultaneous operations.<br>Supply chain could limit supply of dispersant.<br>Limitations on application within ecologically sensitive areas (exclusion zones in place). Including AMPs and State waters (authorisation to spray required). | | | | |
| | Dispersant – Subsea Application (SSDI) | Deterministic modelling indicates SSDI is likely to have a negligible effect on the mass of surface oil. Although oil droplet sizes in the subsea plume were reduced from a median size of 4.3 mm (unmitigated) to 3.6 mm (SSDI applied), they were still generally quite large and therefore still rose to the sea surface at a similar rate to the unmitigated scenario. The subsea dynamics of this relatively slow velocity discharge does not provide enough turbulent energy to allow significant dispersion to occur. This would equally apply to the smaller volumes and lower flow rates associated with a loss of flowline inventory.<br>Further detail is provided within Section 6.3.3.<br>Application of SSDI may reduce VOCs at surface (to below LELs) to enable the safe deployment of a capping stack. | Discharge of dispersant into environment.<br>Adds chemical to environment when it is not likely to impact high or extreme environment receptors.<br>No removal of crude oil from environment. | Effectiveness of response strategy<br>Health, safety & environmental considerations may delay implementation.<br>Mobilisation & deployment of SSDI equipment.<br>Crude oil may only be amenable to dispersion for 24 to 48 hours after release. | Level 2 – MDO | No | - | Strategy aims to increase dispersion (entrainment of fine oil droplets) and reduce the amount of oil expressing at sea surface and may reduce volume of oil loading on shorelines.<br>Potential reduction of VOCs at surface to safe marine operations. |
| | | | | | Level 2 – Crude (Flowline release) | No | - | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Secondary | |
| **RS4** | Marine Recovery | Limits the movement of surface crude in the marine environment and recovers oil from environment.<br>Not applicable for diesel spills due to rapid dispersion and spreading and therefore unlikely to encounter films great than 20-25 µm.<br>Oil needs to be >100 g/m$^2$ (O'Brien, 2002) to feasibly corral oil with a boom and achieve any significant level of oil recovery (reasonable level of efficiency) with the skimmers.<br>For a crude oil spill, where the slick would be more persistent, less volatile, and likely to be present on the sea surface at appropriate concentrations (>100 g/m$^2$) for an extended period a contain and recovery operation may be possible.<br>The deployment of booms and skimmers to recover crude oil is a suitable response strategy in a sheltered environment with non-emulsified heavy oils. Therefore, this strategy's effectiveness may sometimes be limited by the prevailing sea state conditions of the North West Marine Region (NWMR). | Operation of vessels (e.g., burn fuel, physical presence, discharges) for the placement and movement of booms.<br>Equipment and labour intensive.<br>Waste disposal of recovered crude oil.<br>Cleaning and disposal of contamination from boom. | Boom deployment may be delayed in serious incident where safety of personnel is priority.<br>Wind and surface currents are key constraint for the boom operation in the open ocean.<br>Current speed for boom (approx. 1 knot depending on boom and angle).<br>Inefficient and impractical on thin slicks, in inclement weather or high seas<br>Oil recovery typically <10% of the oil spilled in open ocean environments.<br>Requires surface oil thick enough for the response option to be effective Bonn Agreement Oil Appearances Code 4 (discontinuous true oil colour) and 5 (continuous true oil colour)<br>The strategy is labour intensive when the effort is considered against overall effectiveness in reducing the volume of floating oil (i.e., it only covers a small area of spill with 1 or 2 vessels deploying booms, plus numerous personnel).<br>Other limitations including reduced effectiveness at >0.7 to 1 knot current speeds (IPIECA-IOGP, 2015a) (these current speeds are often experienced in the region); ineffectiveness in adverse sea states (>20 knots / 1.8 m wave height) routinely experienced during dry season and monsoonal conditions in the NWMR, skimmer reduced effectiveness in open ocean and with emulsified oils, | Level 2 – MDO | No | - | Deployment of equipment (booms, skimming equipment) for recovery of oil slicks from sea surface and potentially reduce volumes contacting shorelines. Limited benefit anticipated due to operational constraints.<br>Not suitable for MDO spills due to rapidly spreading and high evaporation rates. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Secondary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Secondary | |

| RS # | Spill Response Strategy | Overview of Environmental Benefits | Associated Environmental Risks/ Impacts | Operational Constraints | Apply Response | | Primary or Secondary Response | Justification Note |
|---|---|---|---|---|---|---|---|---|
| | | | | and logistical issues associated with recovered waste at sea (ITOPF, 2011a). As such, containment and recovery will remain a challenging response strategy against crude oil spills in the NWMR. | | | | |
| **RS5** | Shoreline Protection | Limiting of hydrocarbon loading on sensitive shoreline receptors. If post-spill modelling & operational monitoring suggests impact to sensitive resources protective and deflective booming should be undertaken to limit shoreline exposure.<br>In the event of a spill, the WA DoT IMT (as Controlling Agency), in consultation with AMOSC and BHP IMT, would consider resource protection response options, based on the outcome of real-time evaluation of available monitoring data.<br>It should also be noted that for shorelines, the WA DoT would make the ultimate decision on the response strategies to be implemented, with support provided by BHP. | Operation of vessels / vehicles / machinery (e.g., routine emissions and discharge, artificial light, physical presence / disturbance).<br>Benthic disturbance.<br>Response personnel e.g., physical presence / disturbance, waste).<br>Cultural heritage disturbance.<br>Cleaning of contaminated booms and waste disposal of recovered crude and water. Waste disposal of recovered crude oil.<br>Cleaning and disposal of contamination from boom. | Wind and surface currents are key constraint for the boom operation in the open ocean.<br>Resources and logistics support. Current speed for boom (approx. 1 knot depending on boom and angle).<br>Inefficient and impractical on thin slicks, in inclement weather or high seas.<br>Oil recovery typically <10% of the oil spilled in open ocean environments.<br>Requires surface oil thick enough for the response option to be effective Bonn Agreement Oil Appearances Code 4 (discontinuous true oil colour) and 5 (continuous true oil colour).<br>Tidal range and timings.<br>Restricted access.<br>Hours of operation. | Level 2 – MDO | Yes | Primary | Applicable to Level 2 and Level 3 spills to minimise the amount of hydrocarbons contacting shorelines. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS6** | Mechanical Dispersion | No significant benefit unless this technique is coupled with the use of dispersants. | Operation of vessel (e.g., burn fuel, physical presence, discharges). | Offshore vessels are designed not to cavitate, so not efficient at breaking up hydrocarbon films.<br>Small particle size required otherwise material resurfaces.<br>Wind speeds above 20 knots provide natural dispersion, making this method redundant.<br>Cannot be performed where there are high concentrations of vapour. | Level 2 – MDO | No | - | Mechanical dispersion uses vessels with propellors that can cavitate. The turbulence created helps to break-up surface slicks, dispersing hydrocarbons into the column where biodegradation process are enhanced due to smaller droplet sizes.<br>This strategy requires vessels on site with engines that cavitate.<br>Wave action provides some effect. |
| | | | | | Level 2 – Crude (Flowline release) | No | - | |
| | | | | | Level 3 – Crude (Loss of well control) | No | - | |
| **RS7** | In-Situ Burning | Reduces surface oil. | Operation of a 4-vessel spread (2 x boom sweep, 1 x igniter, 1 x observer).<br>Particulates (smoke) in air with associated health risks.<br>Incomplete combustion may produce toxic chemicals. | Need to build a thick film for ignition (5 to 10 mm).<br>Wind is a key constraint, calm seas and ideal conditions are considered necessary for booming operations to get a thick film thickness and safe ignition.<br>Availability of fire boom. | Level 2 – MDO | No | - | Not applicable as insufficient surface slick thickness predicted.<br>The experience and expertise is not readily available in Australia. |
| | | | | | Level 2 – Crude (Flowline release) | No | - | |
| | | | | | Level 3 – Crude (Loss of well control) | No | - | |
| **RS8** | Shoreline Clean-Up | Potentially effective shoreline strategies are:<br>• Natural recovery;<br>• Deflection and protection;<br>• Manual recovery; and<br>• Debris removal.<br>However, shoreline clean-up has been consistently found to not enhance ecological recovery of oiled coastlines (Sell *et al.*, 1995) but it may protect other resources in the area, such as birds, marine mammals or subtidal habitats including coral reefs or fish farms (CSIRO, 2016). Choosing a particular clean-up technique is dependent on factors such as shoreline type, exposure, sensitivity, amount | Potential for additional disturbance to Biologically Important Areas (BIAs) / important wetlands – turtle and shorebirds.<br>Potential for additional disturbance to cultural heritage sites.<br>Sensitive shorelines with lower energy, such as mudflats and mangroves on the WA coastline and any coral reefs could be damaged by the physical activities associated with shoreline clean-up, and therefore these locations should be left to self-clean.<br>Labour intensive – Health & Safety risks.<br>Logistics – habitat & social disturbance. Invasive marine species (IMS) introduction. | Shoreline characteristics (substrate type, beach type, exposure to wave action, biological, social, heritage or economic resources, amount of crude present) and access requirements. | Level 2 – MDO | Yes | Primary | Highly volatile components likely to evaporate prior to shoreline contact, hence shoreline clean-up may cause more impact than the hydrocarbons. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |

| RS # | Spill Response Strategy | Overview of Environmental Benefits | Associated Environmental Risks/ Impacts | Operational Constraints | Apply Response | | Primary or Secondary Response | Justification Note |
|---|---|---|---|---|---|---|---|---|
| | | of oil, persistence of oil, toxicity of oil and rate of natural oil removal (IPIECA-IOGP, 2015a).<br>In the event of a spill, the WA DoT IMT (as Controlling Agency), in consultation with AMOSC and BHP IMT, would consider shoreline clean-up options, based on the outcome of real-time evaluation of available monitoring data.<br>It should also be noted that for shorelines, the WA DoT would make the ultimate decision on the response strategies to be implemented, with support provided by BHP. | Waste management – site contamination. | | | | | |
| **RS9** | Natural Recovery | No additional impacts associated with response activities.<br>Potential benefit in locations where active response strategies have potential to create additional environmental harm. | No additional impacts.<br>Potential for long recovery periods given persistence of crude. | Maintaining site exclusion of oiled environment. | Level 2 – MDO | Yes | Secondary | Makes use of the natural degradation and weathering process to breakdown and remove surface oil and stranded hydrocarbons. Effectively this response strategy means no direct action other than monitor and evaluate spill trajectory and rate of habitat/ community recovery. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Secondary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Secondary | |
| **RS10** | Environmental Monitoring | Benefits outweigh impacts. Primary tool for determining the extent, severity and persistence of environmental impacts from oil spills, and determine how effective the oil spill response is being in protecting the environment. | Labour intensive – Health & Safety risks.<br>Logistics – habitat & social disturbance. IMS introduction.<br>Operation of vessel (e.g., burn fuel, physical presence, discharges).<br>Noise from support vessels and helicopters.<br>Vessel collision.<br>Obstacles to other sea users. | Weather conditions may put constraints on visual observations (vessel and/or aerial).<br>Stringent safety management requirements for aerial and marine operations.<br>Potential coordination of multiple vessels/ aircraft within limited area (SIMOPS). | Level 2 – MDO | Yes | Primary | Applicable to Level 2 and Level 3 spills to monitor impact and recovery from oil spill events. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS11** | Oiled Wildlife Response | Pre-oiling activities including onshore exclusion barriers, hazing and pre-emptive capture used to reduce incidence of animals becoming oiled. Post-oiling activities including collection and rehabilitation to treat oiled fauna and return to similar suitable habitat.<br>In the event of a spill, the WA DoT IMT (as Controlling Agency), in consultation with DBCA, AMOSC and BHP IMT, would consider oiled wildlife response options, based on the outcome of real-time evaluation of available monitoring data.<br>It should also be noted that for response in State jurisdiction, the WA DoT would make the ultimate decision on the response strategies to be implemented, with support provided by BHP. | Labour intensive – Health & Safety risks.<br>Logistics – habitat & social disturbance. IMS introduction.<br>Waste management – site contamination / biological waste.<br>Operation of vessel (e.g., burn fuel, physical presence, discharges).<br>Hazing: Accidentally drive oiled wildlife into oil, or separate groups/individuals (e.g., parent/ offspring pairs).<br>Pre-emptive capture and post-oiled collection: Risk of injury and inappropriate field collection/ handling during pre-emptive capture and post-oiled collection.<br>Rehabilitation: inadequate/ inappropriate animal husbandry leading to stress/ injury/ death. Inappropriate relocation points leading to disorientation / stress.<br>IPIECA-IOGP (2014) advise that the difficulty of capturing wildlife safely and maintaining their health during relocation should not be underestimated, and that working with live or dead animals has health and safety issues including potential injuries (e.g., bites or scratches) or zoonotic diseases. The release of zoonotic diseases from a captured population back into a wild population could result in more significant impacts to overall population viability. | Wind is a key constraint, calm seas and ideal conditions are considered necessary for capture operations.<br>Weather constraints for use of aerial observation/ tracking fauna.<br>Navigation of multiple vessels within a small area.<br>Availability of suitable space/ location in township to handle rehabilitation and fauna treatment.<br>Utilisation of local skilled veterinarians for treatment of oiled wildlife.<br>The translocation of turtles from beaches and islands could require the capture of large numbers of hatchlings at night, followed by translocation to a location far from the slick (to prevent surface oil impacts on released hatchlings). Attempting to capture large numbers of healthy seabirds would be challenging and there is no practicable method to capture healthy seabirds at sea (DPaW, 2014). Any seabirds captured and then released would likely fly back to the shoreline from which they originally were captured. Long-term veterinary care (e.g., feeding, etc.) would be required for any successfully captured birds, until spill weathering or remediation had | Level 2 – MDO | Yes | Primary | Applicable where surface hydrocarbons causes oiling risk to marine fauna. Applicable to Level 2 and Level 3 spills. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |

| RS # | Spill Response Strategy | Overview of Environmental Benefits | Associated Environmental Risks/ Impacts | Operational Constraints | Apply Response | | Primary or Secondary Response | Justification Note |
|---|---|---|---|---|---|---|---|---|
| | | | | occurred, and it was safe to release the animals. Overall, there is a potential for harm of animals captured to occur; however, as a spill response strategy it may result in a positive impact. | | | | |
| **RS12** | Forward Command Post | Benefits outweigh impacts.<br>Establishes local command.<br>Better communication with local resources and stakeholders. | Labour intensive – Health & Safety risks.<br>Logistics – habitat & social disturbance.<br>Mobilisation of personnel to Exmouth, Onslow (or alternate location) – aviation fuel, etc. | Availability of suitable command post (location/ building) in Exmouth.<br>Oil trajectory and potential for multiple / satellite command posts over large geographical area. | Level 2 – MDO | Yes | Secondary | Constant monitoring and evaluation of spill and response activities by people on-location during a spill event. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Secondary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |
| **RS13** | Waste Management | Benefits outweigh impacts.<br>Oiled waste removed from site by trained contractors and dealt with at an approved waste management facility. | Labour intensive – Health & Safety risks.<br>Logistics – habitat & social disturbance. | Logistics constraints in moving waste from site to approved waste facility. | Level 2 – MDO | Yes | Primary | Applicable where hydrocarbons accumulate on shorelines and shoreline clean-up response strategy implemented. |
| | | | | | Level 2 – Crude (Flowline release) | Yes | Primary | |
| | | | | | Level 3 – Crude (Loss of well control) | Yes | Primary | |

### 5.1.2 Operational SIMA Process

In the event of a Level 2 / Level 3 oil pollution emergency, an Operational SIMA will be undertaken to select spill response options that have a net environmental benefit based upon real-time environmental conditions. It is likely that spill response will involve a combination of response options and will evolve over time as conditions change.

The SIMA process is a decision support tool that is used to help select the most appropriate response options that together make up the oil spill response strategies that the IMT are to implement in the event of a spill. Using the Strategic SIMA, the IMT has the foundation for preparing Operational SIMA to inform response priorities.

For oil spill response, the development of the Incident Action Plan (IAP) involves the review of key decision-making criteria which are used as inputs to the Operational SIMA. This ensures the most effective response strategies with the least detrimental impacts can be selected and implemented.

The IMT must first gain situational awareness by obtaining answers to the following key questions, which are fundamental to any oil spill response:

a. What type of oil has been released?

b. What is the expected behaviour of the oil that has been released?

c. What volume has been released?

d. Is the source under control?

e. Where is the oil going?

f. What environmental receptors/sensitivities are in the path of the predicted oil trajectory?

g. Can the oil be approached or are there safety concerns?

h. Can the oil be contained?

i. Can the oil be dispersed?

j. Will shoreline impact occur, and clean-up be required?

To answer these questions, the Incident Commander must review key information such as Engineering advice on the volume and characteristics of the oil released, Oil Spill Trajectory Modelling, Oil Spill Tracker Buoys, the weather forecast, AIS vessel feed, aircraft data feeds, operational reports from field teams and operational and environmental monitoring teams to determine presence and/or extent of environmental receptors, advice from the State Government Environmental Scientific Coordinator (ESC), any other external advice, the window of Ecological Sensitivity (Table 5-4 and Table 5-5), oil spill reference documents (specific to response strategy) and any other Daily Field Reports.

The outcome of this data review step is then used to update the Operational SIMA, which assesses the impacts and risks of response strategy options on environmental sensitivities. The spill response risk assessment applies pre-defined assessment classifications (3P to 3N), as shown in Table 5-3, assess the potential "impact" for the receptor sensitivities for each response option, shown in Table 5-4 and Table 5-5. To aid interpretation where both positive and negative impacts have been indicated for a spill response, cross-referencing potential impacts with the receptor's protection priority can be used to weight benefit/risk to receptors; and those with higher protection priorities can be weighted as of greater importance than risk to lower priorities for the determination of net environmental benefit.

Where a response has "zero" scores for all receptors and sensitivities, this may still be assessed as presenting a net benefit (or carried forward to ALARP assessment) based on potential for indirect (rather than direct) reduction in risk. For example, RS2 Monitor and Evaluate has no direct impact on the spill due to implementation of this strategy, but the situational awareness gained from the response allows proactive and effective application of other response strategies thereby contributing to reduction of risk to ALARP.

The SIMA Matrix (Table 5-3) prioritises environmental sensitivities and assesses the individual net effect that each response option may have on it allowing informed decision to be made. If there are conflicting outcomes for a particular response option, then the sensitivity with the higher priority becomes the preferred response option. A SIMA is a decision-making process and will ultimately result in a trade-off of priorities and response strategies. It is possible for a response strategy to be used for one sensitivity, even if it has been identified that this response option may not benefit one or several other sensitivities. The final outcome of the response, however, should result in an overall environmental benefit. Spill response options selected via the Strategic SIMA are detailed in Section 5.1.4. An evaluation of the impacts and risks of the spill response options is provided in Section 8.

In consultation with WA DoT, the IMT will apply the Operational SIMA process to identify the response options that are preferred for the situation, oil type and behaviour, environmental conditions, direction of plume, and protection priority of sensitive receptors within State jurisdiction.

The steps in the Operational SIMA aim to identify:

1 Key ecological values, environmental, socioeconomic and cultural heritage receptors (see Section 4 of the EP), within the plume path and predicted EMBA based on operational monitoring arrangements in Response Strategy 2 (Monitor and Evaluate);

2 Protection priorities of either High, Medium or Low and determine if receptor is listed as Endangered (E), Threatened (T) or Migratory (M) under the EPBC Act (see Section 4 of the EP);

3 Receptors within the window of Ecological Sensitivity (Table 5-4 and Table 5-5) for the period of the oil spill;

4 New situational awareness information that becomes available from the range of operational monitoring arrangements in Response Strategy 2 (Monitor and Evaluate) such as updated spill trajectory models, observations of oil on the water and/or shorelines, locations of sensitive receptors, effectiveness of implemented response strategies, Daily Field Reports, any updated advice from the ESC / other external sources (e.g. consideration of recommendations from the WA Hazard Management Agency (HMA)) for inclusion into daily updates of the Operational SIMA to optimise the IAP. Some sensitive receptors are mobile (e.g., fish, mammals, birds) and may move in and out of the predicted oil path on numerous occasions throughout the response, requiring frequent review of the SIMA table and selection of response techniques documented in IAPs by the IMT; and

5 For Dispersant Application, evaluate the environmental trade-offs between applying or not applying dispersants to ensure that the response strategy has a positive benefit (see sub-section below). Any dispersant application in or around State waters will require WA DoT approval – Oil Spill Response Coordinator. Any dispersant application within an Australian Marine Park (AMP) will required approval from the Director of National Parks (DNP).

6 Select response strategies to be included in the IAP work instruction

The Planning Section Chief will supervise the development of the IAP with the Incident Management Team. The Incident Commander authorises the IAP prior to releasing it to the Operations Section.

Environmental Trade-offs of Chemical Dispersant Application

The removal of surface oil by surface and subsea dispersant application reduces the risk to marine reptiles, seabirds, shorebirds, marine mammals, mangroves and tourist beaches from contamination, and contributes to achieving the performance outcome of preventing impacts to sensitive receptors. The assessment of using dispersants is, however, not solely dependent on the potential benefits of dispersed oil on surface receptors. In general, the application of dispersant decreases the spatial extent of surface oil, and potential contact with surface/shoreline environmental values or receptors, at the expense of increased spatial exposure to entrained oil. However, the receptors in the oil spill EMBA could potentially be affected by dispersant application in different ways (both positively and negatively).

The environmental benefits evaluation must compare the trade-offs between surface and entrained oil. The output of this process is best represented by a traffic light system to visualise the trade-off between geographical points of interest, and the environmental values, sensitivities and receptors, and the application of dispersants / no dispersants (Table 5-2).

A positive environmental benefit can be interpreted when an Orange box (impact) is followed by either a Green (no impact) or Yellow box (reduced impact) following dispersant application; in this situation, the spatial extent of the oil spill EMBA no longer intersects a particular receptor (Green) or the spatial extent of the oil spill EMBA is reduced (Yellow) with dispersants.

Similarly, Orange box (impact) with no dispersants followed by another Orange box (impact) with dispersants indicates that dispersant application has no benefit, i.e., the impact would still occur irrespective of dispersant application.

A negative environmental benefit can be interpreted when a Green box (no impact) is followed by an orange box (impact) or an orange box (impact) is followed by a red box (increased impact); in this situation, the spatial extent of the oil spill EMBA now intersects a particular receptor (Orange) or the spatial extent of the oil spill EMBA is increased (Red) with dispersants.

An environmental trade-off analysis will be carried out as part of the daily Operational SIMA and dispersants will not be applied unless there is a positive environmental benefit, or the intent of dispersant application is to reduce health and safety risks to responders (as may be the case with SSDI).

**Table 5-2: Environmental trade-offs associated with chemical dispersant application**

| No Dispersant | With Dispersant | Trade-off |
|---|---|---|
| **Impact** | No impact | Positive benefit |
| **Impact** | Reduced impact | |
| **Impact** | Impact | No benefit |
| **No impact** | Impact | Negative benefit |
| **Impact** | Increased | |

Note: Green – not impacted by hydrocarbons, Orange – impacted by hydrocarbons; Yellow – reduced spatial impact to receptor; Red – increased spatial impact to receptor

*Daily Operational SIMA Process for Chemical Dispersant Application*

In summary, the process of the daily Operational SIMA for approving dispersant application is described below:

1. Determine that oil is amenable to be dispersed and within the window of opportunity when chemical dispersants are effective. Dispersant monitoring and efficacy tests confirm effectiveness of available dispersants, including the results from water column and air quality monitoring during SSDI operations;
2. Obtain oil spill trajectory model and determine what environmental sensitivities are in the predicted path of the spill. Consider model outputs that contain both with and without dispersant application;
3. Determine the temporal/seasonal window of ecological sensitivity and assess any receptors that occur within that window, which require evaluation;
4. Assess operational reports from field teams, and operational and environmental monitoring to determine presence and/or extent of environmental receptors;
5. Evaluate the environmental trade-offs between applying or not applying dispersants to ensure that the environmental trade-off provides a positive outcome;
6. Assess the operational conditions (wind, waves etc.) to determine that dispersant application operations will occur in a safe and effective manner; and
7. Provide a recommendation to the BHP Incident Commander, taking into consideration any recommendations from the WA Hazard Management Agency (HMA).

### 5.1.3 Protection Priorities

For any oil spill entering or within WA State waters/shorelines, the WA Controlling Agency is the ultimate decision maker regarding identification and selection of protection priorities.

The WA Controlling Agency will utilise their internal processes which typically includes the following:

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

The WA Controlling Agency will adjust/amend their internal processes to suit the spill situation at the time.

**Table 5-3: SIMA potential impact categories relative to mitigative response strategies**

| SIMA Categories | | | Degree of Impact | Potential Duration of Impact | Equivalent BHP Severity Risk Matrix Consequence Level |
|---|---|---|---|---|---|
| **Positive** | **3P** | **Major** | Likely to prevent:<br>• Behavioural impact to biological receptors;<br>• Behavioural impact to socio-economic receptors, e.g., changes day-to-day business operations, public opinion/behaviours (e.g., avoidance of amenities such as beaches), or regulatory designations. | Decrease in duration of impact by > 5 years | N/A |
| | **2P** | **Moderate** | Likely to prevent:<br>• Significant impact single phase of reproductive cycle for biological receptors; or<br>• Detectable financial impact, either directly (e.g., loss of income) or indirect (e.g., via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region. | Decrease in duration of impact by 1-5 years | N/A |
| | **1P** | **Minor** | Likely to prevent impact to:<br>• Significant proportion of population or breeding stages, for biological receptors; or<br>• Significant impact to the sensitivity of protective designation for socio-economic receptors; or significant long-term impact to business/ industry. | Decrease in duration of impact by several seasons (< 1 year) | N/A |
| | **0** | **Non-mitigated spill impact** | No detectable difference to unmitigated spill difference | | |
| **Negative** | **1N** | **Minor** | Likely to result in:<br>• Behavioural impact for biological receptors;<br>• Behavioural impact for socio-economic receptors, e.g., changes day-to-day business operations, public opinion/behaviours (e.g., avoidance of amenities such as beaches), or regulatory designations.<br>**[Note 1]** | Decrease in duration of impact by several seasons (< 1 year) | Measurable but limited impact to the environment, where recovery of ecosystems function takes less than 1 year. BHP Petroleum Risk Matrix Severity Level 2, Non-Material Risk |
| | **2N** | **Moderate** | Likely to result in:<br>• Significant impact single phase of reproductive cycle for biological receptors; or<br>• Detectable financial impact, either directly (e.g., loss of income) or indirect (e.g., via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region. | Increase in duration of impact by 1-5 years | Substantial impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years. BHP Petroleum Risk Matrix Severity Level 4, Non-Material Risk |
| | **3N** | **Major** | Likely to result in impact to:<br>• Significant proportion of population or breeding stages, for biological receptors; or<br>• Significant impact to the sensitivity of protective designation for socio-economic receptors; or<br>• Significant long-term impact to business / industry for socio-economic receptors. | Increase in duration of impact by > 5 years or unrecoverable | Severe impact to the environment and where recovery of ecosystem function takes 10 years or more. BHP Petroleum Risk Matrix Severity Level 5, Material Risk |
| **[Note 1]** | | | Behavioural impacts tend to be short-term and limited in their impact (even on a regional scale). The maximum likely should be considered if a response strategy directly impacts behaviour that results in an impact to reproduction and/or the breeding population, e.g., failure of fish spawning aggregations, then score should be a 2 or 3 rather than 1. | | |

**Table 5-4: SIMA: North-West region – Response strategy selection considerations**

| Receptor | Value | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | RS1 Source Control | RS2 Monitor and Evaluate | RS3.1 Surface Dispersant Application | RS3.2 Subsea Dispersant Application | RS4 Marine Recovery | RS5 Shoreline Protection | RS6 Mechanical Dispersion | RS7 In situ Burning | RS8 Shoreline Clean-up | RS10 Environmental Monitoring | RS11 Oiled Wildlife Response | RS 13 Waste Management |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ecological* | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Whales** | High (T, M) | N | N | N | N | N | N | Y | Y | Y | Y | N | N | 2P | 0 | 1N | 1N | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| **Dugongs** | High (M) | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1N | 1N | 1P | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Dolphins** | High (M) | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1N | 1N | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| **Whale sharks** | High (T, M) | N | N | Y | Y | Y | Y | N | N | N | N | N | N | 2P | 0 | 1N | 1N | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| **Fishes (resident, demersal, pelagic)** | High | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1N | 2N | 1P | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Turtles (foraging, interesting, nesting)** | High (T, M) | Y | Y | Y | N | N | N | N | N | Y | Y | Y | Y | 2P | 0 | 1N | 1N | 1P | 2P | 1P | 2N | 1P | 0 | 2P | 0 |
| **Migratory birds** | Extreme (T, M) | Y | Y | Y | Y | N | N | N | N | Y | Y | Y | Y | 2P | 0 | 2P | 2P | 1P | 1P | 2P | 2N | 1P | 0 | 2P | 0 |
| **Seabirds** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 2P | 2P | 1P | 1P | 2P | 2N | 0 | 0 | 2P | 0 |
| **Shorebirds** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 2P | 2P | 1P | 1P | 2P | 2N | 1P | 0 | 2P | 0 |
| **Coral spawning** | Medium | Y | Y | Y | Y | N | N | N | N | Y | Y | Y | Y | 2P | 0 | 1N | 2N | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| *Habitat/Ecosystem* | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Mangroves** | Extreme | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1P | 1N | 1P | 2P | 1P | 3N | 2N | 0 | 0 | 0 |
| **Coral reef** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1N | 2N | 1P | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Seagrasses** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1N | 1N | 1P | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Sandy beaches** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1P | 1P | 1P | 1P | 1P | 1P | 1P | 0 | 0 | 2P |
| **Rocky shore** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1P | 1P | 1P | 1P | 1P | 1P | 0 | 0 | 0 | 0 |
| **Open waters** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1N | 1N | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| *Socio-economic* | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Tourism** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1P | 1P | 1P | 2P | 1P | 2N | 2P | 0 | 0 | 2P |
| **Fisheries** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1N | 2N | 0 | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Cultural Heritage** | High | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 2P | 0 | 1P | 1P | 1P | 2P | 1P | 0 | 2P | 0 | 0 | 2P |
| **Response strategy provides Net Environmental Benefit?** | | | | | | | | | | | | | | Yes | Yes | Potential | Potential | Yes | Yes | No | No | Yes | Yes | Yes | Yes |
| **Response strategy feasible?** | | | | | | | | | | | | | | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes |
| **Is response strategy recommended (and ALARP assessment required)?** | | | | | | | | | | | | | | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes |

*Protection priority: This ranking is based on a combination of factors including the likelihood of impact (time of year), severity of impact (type of exposure to the sensitivity, where the sensitivity is listed as Threatened (T) or Migratory (M) under the EPBC Act) and recovery time after exposure to hydrocarbons). WA DoT (as Controlling Agency) confirms protection priorities in State jurisdiction.

Shoreline response: Where shoreline clean-up has been given a negative score, this indicates that the use of equipment, machinery and personnel in that environment is likely to have negative effect, potentially causing more damage and prolonging the recovery and environmental benefit to that sensitivity. WA DoT (as Controlling Agency) makes ultimate decision on appropriateness of shoreline response techniques.

**Table 5-5: SIMA: South-West region – Response strategy selection considerations**

| Receptor | Value | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | RS1 Source Control | RS2 Monitor and Evaluate | RS3.1 Surface Dispersant Application | RS3.2 Subsea Dispersant Application | RS4 Marine Recovery | RS5 Shoreline Protection | RS6 Mechanical Dispersion | RS7 In situ Burning | RS8 Shoreline Clean-up | RS10 Environmental Monitoring | RS11 Oiled Wildlife Response | RS 13 Waste Management |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ecological* | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Whales** | High (T, M) | N | N | N | N | N | N | Y | Y | Y | Y | N | N | NA | 0 | 1N | NA | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| **Dolphins** | High (M) | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1N | NA | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| **Fishes (resident, demersal, pelagic)** | High | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1N | NA | 1P | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Turtles (foraging, interesting, nesting)** | High (T, M) | Y | Y | Y | N | N | N | N | N | Y | Y | Y | Y | NA | 0 | 1N | NA | 1P | 2P | 1P | 2N | 1P | 0 | 2P | 0 |
| **Migratory birds** | Extreme (T, M) | Y | Y | Y | Y | N | N | N | N | Y | Y | Y | Y | NA | 0 | 2P | NA | 1P | 1P | 2P | 2N | 1P | 0 | 2P | 0 |
| **Seabirds** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 2P | NA | 1P | 1P | 2P | 2N | 0 | 0 | 2P | 0 |
| **Shorebirds** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 2P | NA | 1P | 1P | 2P | 2N | 1P | 0 | 2P | 0 |
| **Coral spawning** | Medium | Y | Y | Y | Y | N | N | N | N | Y | Y | Y | Y | NA | 0 | 1N | NA | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| *Habitat/Ecosystem* | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Coral reef (Rottnest Island)** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1N | NA | 1P | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Seagrasses** | Medium | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1N | NA | 1P | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Sandy beaches** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1P | NA | 1P | 1P | 1P | 1P | 1P | 0 | 0 | 2P |
| **Rocky shore** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1P | NA | 1P | 1P | 1P | 1P | 0 | 0 | 0 | 0 |
| **Open waters** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1N | NA | 1P | 0 | 1N | 2N | 0 | 0 | 0 | 0 |
| *Socio-economic* | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Tourism** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1P | NA | 1P | 2P | 1P | 2N | 2P | 0 | 0 | 2P |
| **Fisheries** | Low | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1N | NA | 0 | 0 | 1N | 0 | 0 | 0 | 0 | 0 |
| **Cultural Heritage** | High | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | NA | 0 | 1P | NA | 1P | 2P | 1P | 0 | 2P | 0 | 0 | 2P |
| **Response strategy provides Net Environmental Benefit?** | | | | | | | | | | | | | | NA | Yes | No | NA | Yes | Yes | No | No | Yes | Yes | Yes | Yes |
| **Response strategy feasible?** | | | | | | | | | | | | | | NA | Yes | No | NA | Yes | Yes | No | No | Yes | Yes | Yes | Yes |
| **Is response strategy recommended (and ALARP assessment required)?** | | | | | | | | | | | | | | NA | Yes | No | NA | Yes | Yes | No | No | Yes | Yes | Yes | Yes |

*Protection priority: This ranking is based on a combination of factors including the likelihood of impact (time of year), severity of impact (type of exposure to the sensitivity, where the sensitivity is listed as Threatened (T) or Migratory (M) under the EPBC Act) and recovery time after exposure to hydrocarbons). WA DoT (as Controlling Agency) confirms protection priorities in State jurisdiction.

Shoreline response: Where shoreline clean-up has been given a negative score, this indicates that the use of equipment, machinery and personnel in that environment is likely to have negative effect, potentially causing more damage and prolonging the recovery and environmental benefit to that sensitivity. WA DoT (as Controlling Agency) makes ultimate decision on appropriateness of shoreline response techniques.

### 5.1.4 Selected Response Strategies

A summary of the strategies selected during the strategic SIMA process is presented in Table 5-6.

Details for the implementation of each applicable response strategy including initiation criteria, call-out, and termination criteria are presented within the OPEP.

**Table 5-6: Applicable response strategies for Pyrenees Phase 4 spill scenarios**

| Response Strategy | 330m³ Diesel Loss from Vessel Storage Tank (Level 2) | 77 m³ Crude Flowline Content Loss (Level 2) | 156,774 m³ Crude Loss of Containment (Level 3) |
|---|---|---|---|
| RS1.1: Source Control – Vessel-based | ✓ | ✗ | ✗ |
| RS1.2: Source Control – Subsea Intervention | ✗ | ✓ | ✓ |
| RS1.3: Source Control – Relief Well | ✗ | ✗ | ✓ |
| RS1.4: Source Control – Capping Stack | ✗ | ✗ | ✓ |
| RS1.5: Source Control – Subsea First Response Toolkit (SFRT) | ✗ | ✓* | ✓ |
| RS2: Monitor and Evaluate | ✓ | ✓ | ✓ |
| RS3.1: Dispersant - Surface Application | ✗ | ✓ | ✓ |
| RS3.2: Dispersant – Subsea Application | ✗ | ✗** | ✓** |
| RS4: Marine Recovery | ✗ | ✓ | ✓ |
| RS5: Shoreline Protection | ✓* | ✓ | ✓ |
| RS6: Mechanical Dispersion | ✗ | ✗ | ✗ |
| RS7: In-Situ Burning | ✗ | ✗ | ✗ |
| RS8: Shoreline Clean-up | ✓* | ✓ | ✓ |
| RS9: Natural Recovery | ✓ | ✓ | ✓ |
| RS10: Environmental Monitoring | ✓ | ✓ | ✓ |
| RS11: Oiled Wildlife Response | ✓ | ✓ | ✓ |
| RS12: Forward Command Post | ✓ | ✓ | ✓ |
| RS13: Oil Contaminated Waste Management | ✓ | ✓ | ✓ |

* Potentially activated depending on reports/observations of RS2 Monitor and Evaluate.

** Limited effectiveness due to moderate flow rates from well and low mixing rates of dispersant.

Each option has advantages and disadvantages with regard to effectiveness, operational constraints, and environmental impacts. Consequently, spill response strategies need to be assessed on a case-by-case basis, considering the nature of the spill, OSTM, the weather conditions, and the advantages and disadvantages of each response strategy.

# 6 Field Capability Basis of Assessment

This section presents the relevant information by which to undertake the detailed field capability assessments for each Response Strategy presented in Section 7. Supporting information applied to form the basis of the field capability assessment include:

- selection of WCDs for detailed field capability assessment;
- cone of response model;
- oil spill budgets to inform dispersant application; marine recovery; in-situ burning; shoreline protection and clean-up; and oiled wildlife response; and
- summary of tiered preparedness models inclusive of assumed capability need to successfully implement each response strategy.

## 6.1 Selection of WCD for Field Capability Assessment

In accordance with the processes described in IPIECA-IOGP (2013) Part 2, a single WCD scenario has been selected for detailed Field Capability Assessment, due to nature and scale and Strategic SIMA outcome. Justification for the selected scenario is provided in Table 6-1.

**Table 6-1: Selection of WCD for field capability assessment**

| WCD | Selected? (Yes/No) | Justification |
|---|---|---|
| Subsea release of crude oil from a loss of containment from the Stickle-4H1 well. | Yes | This scenario represents the largest release of crude oil from the Pyrenees field. The release would be from near the sea floor. |
| Subsea release of crude oil from Crosby or Stickle subsea flowline due to rupture from dropped object or anchor drag. | No | This scenario would release the same crude as the loss of well control scenario, also on the sea floor, but the quantity released would be far less. The consequences for the environment would therefore also be far less. |
| Surface release of MDO from fuel tank rupture on an AHTS vessel. | No | This scenario would have less impact than the loss of well control scenario with fewer response strategies being applicable. Those that are similarly applicable would be to a reduced scale compared with a LOWC event. |

## 6.2 Cone of Response

To maximise the effectiveness of the overall response effort, the most effective and advantageous options should be deployed as close to the source as possible, depending on safety and operational limitations. Supplementary actions should then radiate out from this location. This approach is known as the 'cone of response' model. Optimising the response in this way can help to maximise the removal of oil from the water's surface (IPIECA-IOGP, 2015a).

IPIECA-IOGP (2015b) have developed a similar cone of response model (refer to Figure 6-2); however, this only considered the at sea response strategies.

Figure 6-1 provides the layout of at-sea response strategies with Zone A for Containment and Recovery (C&R) located closest to the spill source, followed by Zone B for FWAD and Zone C for vessel dispersant at increasing distances from the spill source. In contrast, the IPIECA-IOGP (2015b) model (Figure 6-2), shows dispersant operations closest to the spill source and C&R used adjacent to a shoreline sensitivity.

Another 'cone of response' model, which commences from the start of the spill has been developed by AMOSC, provided as Figure 6-3.

These various models have been provided, as an indication of the potential variety of configurations in which the various response strategies can be deployed, to achieve specific response objectives.

The field capability assessment process is used to assess and determine the most suitable capabilities and arrangements for the various response strategies for each WCDs. Where relevant, the field capability assessment should take into consideration the various 'cone of response' models available, and different outcomes which can be achieved by varying how and where each response strategy is implemented.

Source control activities such as capping stack deployment, debris clearance and relief well drilling are summarised within the scope of this document, however detailed source control capabilities and arrangements are provided within the BHP Source Control Emergency Response Plan (SCERP).

Remote shoreline operations are not typically addressed in spill response literature and the cone of response models. Remote shoreline operations are considered within the OPEP. The OPEP encompasses a region with low levels of infrastructure along the mainland coastline near Exmouth, numerous islands within WA coastal waters, and remote offshore islands/reef systems. Therefore, some response activities such as SCAT, shoreline protection, shoreline clean-up and OWR may require the use of a large accommodation vessel from which to mount logistics. This vessel would act as an offshore staging area, as shown in Figure 6-1. However, additional logistical support such as smaller vessels, landing barges and light utility helicopters would be required to facilitate response logistics.

Remote shoreline oil spill response in north-western Australia present logistical constraints and hazards including:

- remoteness of most locations (flight times to nearest town/city, minimal local services available)
- minimal infrastructure (i.e., roads, ports, airfields) at most shoreline location
- potentially large tidal ranges and challenging met ocean conditions making shoreline landing via vessel difficult at times
- marine fauna hazards, especially for islands closer to the mainland
- heat/humidity

Response can sometimes be facilitated along remote mainland shorelines that have road access by establishing remote accommodation camps/forward operating bases (FOBs).

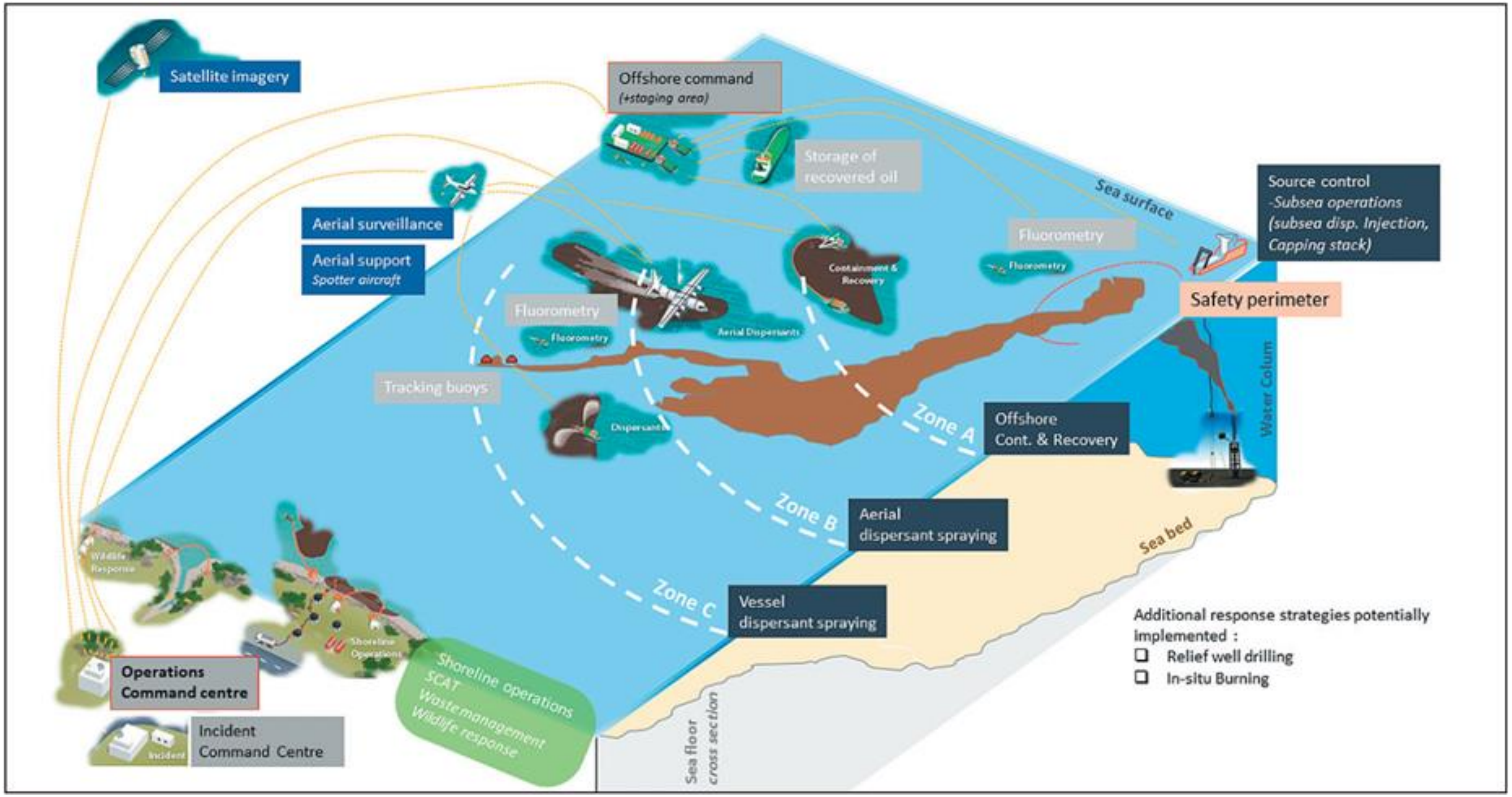



**Figure 6-1: Cone of response model (Source: EOSP, 2012)**

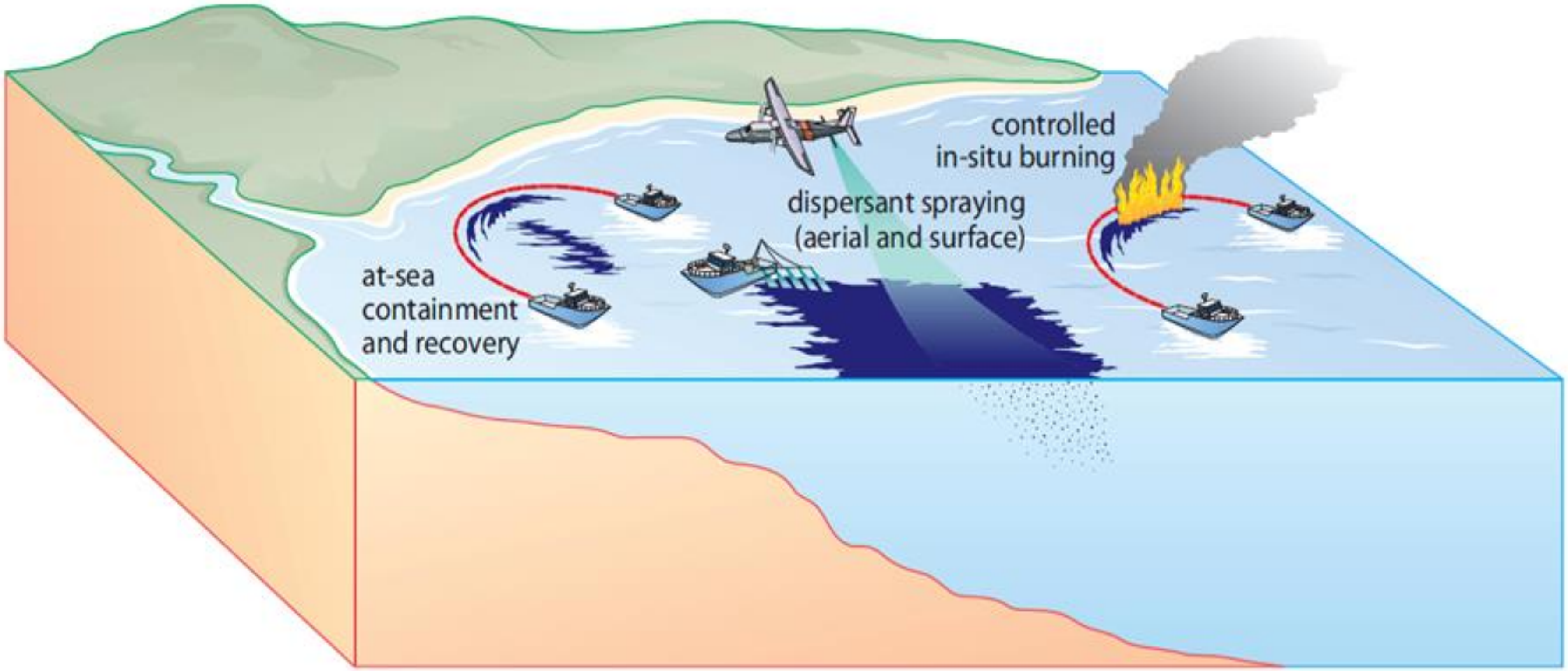



**Figure 6-2: At sea response techniques for responding to a surface spill (Source: IPIECA, 2015b)**

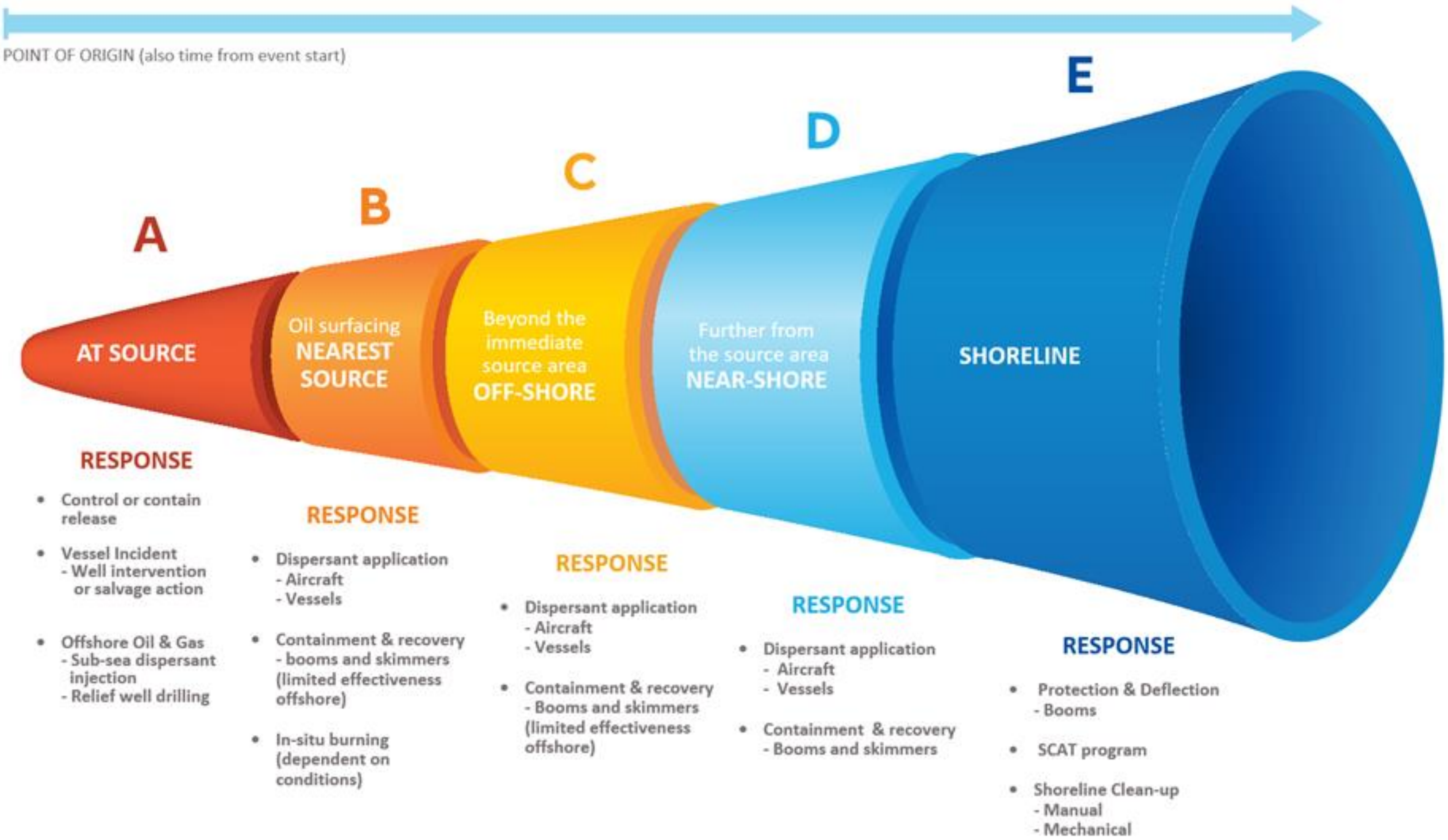



**Figure 6-3: Cone of response - AMOSC model**

## 6.3 Oil Spill Budget

An oil spill budget is a process used to assist in the evaluation of the field response capability, based on the volume/thickness of oil within a certain area, weathering, behaviour of the oil over time in the environment, and the effectiveness of the various response strategies.

Oil spill budgets are used as part of the field capability assessments, presented in Section 7.

The below sub-sections describe factors affecting an oil spill budget for the various response strategies.

Generation of an oil spill budget can provide an early indication of several response parameters including:

- potential waste volumes
- scale of response
- duration of response
- efficacy of specific response strategies.

### 6.3.1 Source Control – Capping Stack

Deterministic spill modelling undertaken by GHD (2021) on behalf of BHP was used to compare unmitigated (69-day LOWC scenario) with a deployment of capping stack (mitigated scenario) against various worst-case modelling realisations. At the request of BHP, GHD modelled a highly conservative deployment and well capping timeframe of 25-days. Detailed response time modelling (RTM) indicates well capping could be achieved in a shorter timeframe of approximately 16-days (see Section 7.2.5). A summary of the potential effectiveness of capping stack deployment and well control for two worst-case spill model realisations is presented below.

The source control (capping stack) simulation for the realisation used to determine the highest accumulated shoreline mass above the moderate threshold (100 g/m$^2$) across all shorelines yielded the following outcomes:

- The total shoreline loading across all shorelines reduced significantly from 11,485 tonnes (unmitigated) to 5,584 tonnes (source control simulation). Substantial reductions were predicted at Hedland Region (~1,700 tonnes reduction), Dampier Archipelago (~800 tonnes reduction), Barrow Island (~300 tonnes reduction), Dampier Region (~2,700 tonnes reduction) and Onslow Region (~900 tonnes reduction), as these receptors received significant loading after day 25 during the unmitigated scenario which was mitigated by implementing the well capping at day 25.
- The total mass of surface oil and entrained oil is significantly reduced compared to the unmitigated scenario after well kill on day 25, as expected.
- The footprints of surface oil exceeding 10 µm were significantly reduced, while the footprints for total submerged oil and dissolved hydrocarbons were similar between the two scenarios.
- The median droplet sizes produced by the subsea discharge remains unchanged compared to the unmitigated scenario.

The source control (capping stack) simulation for this realisation used to determine the greatest accumulated shoreline load (above 100 g/m$^2$) at the Ningaloo Region yielded the following outcomes:

- Total loading across all shorelines reduced marginally from 11,050 tonnes (unmitigated) to 10,976 tonnes (source control simulation). This reduction was primarily due to a decrease at Barrow Island (693 tonnes unmitigated reduced to 588 tonnes for source control). The relatively minor reduction in shoreline loading is because it mostly occurred during the first 32 days with accumulation primarily from oil releases during the initial 25 days. Therefore, the earlier well kill for the source control deterministic simulation did not materially reduce shoreline loads for this particular realisation.

- The total mass of surface oil and entrained oil is significantly reduced relative to the unmitigated scenario after day 25, as expected.
- Marginal reductions in the spatial extents of surface oil exceeding 10 µm, total submerged oil exceeding 100 ppb and dissolved hydrocarbons exceeding 10 ppb were simulated, although the maximum linear distances of the thresholds from the well remained similar to the unmitigated scenario.
- The median droplet sizes from the subsea discharge is unchanged relative to the unmitigated scenario.

In summary, source control by day 25 of the LOWC yields a significant benefit to predicted shoreline loading across all shorelines, reducing the peak shoreline load up to 49% of the unmitigated (i.e., source control at day 69) realisation. However, similar loading at the Ningaloo Region is predicted irrespective of the implementation of source control via capping stack on day 25 when compared with a 69-day scenario. However, it should be noted that further reductions in peak shoreline loading would be expected should the well be capped within 16-days as modelled.

### 6.3.2 Surface Dispersant Application (SDA)

Dispersant application is designed to transfer oil from the surface of the ocean to the water column and to enhance the natural process of biodegradation. Being able to target oil closest to the source provides the best outcome in terms of efficacy of the dispersant product on the hydrocarbon. This minimises the ongoing impact of pollution in the environment and reduces the overall potential oil spill budget. Dispersants can treat more oil over time typically than other response options due to the versatility of application using both aircraft and vessels. Careful planning for dispersant operations will ensure that any requirement for dispersant application can continue as needed for the duration of a response.

For successful operations, the dispersant must be effective. This can be determined in several ways including:

- jar test (from a sample collected at source or spill) conducted on site
- efficacy testing by a laboratory on known products and hydrocarbons
- visual analysis by trained responders of test spray from aircraft or vessel

Noting that for heavier oils dispersion can take longer (up to 30 minutes) to occur depending on the dose/concentration applied and wind/wave activity, which will drive mixing of the dispersant into the oil.

Australian stockpiles of dispersant consist of products considered to be effective on a broad range of oils rather than specific to a given type. The application rate may change considerably (high application rates for thicker layers of viscous oil, lower rates for thinner, lighter oils) but efficacy on a typical crude, according to IPIECA, is usually above 70%.

Efficacy testing of fresh Pyrenees crude oil (Department of Primary Industries, 2004) indicated it may be treated by all the chemical dispersants tested, with the best performing dispersants being Corexit 9500A, Corexit 9527A, and Slickgone NS. Samples were tested after being subject to 10 minutes of wind/wave energy simulated in laboratory conditions using the Mackay apparatus. The application of the chemical dispersants effectively dispersed over 75% of the oil.

Fresh and weathered Pyrenees crude oil was also tested with dispersants Ardrox 6120 and Finasol OSR52 to determine the dispersant efficacy (Intertek Geotech, 2014). Weathering of the Pyrenees crude oil was undertaken using the Mackay-Nadeau-Steelman weathering apparatus. A sample of the crude oil was weathered by exposing the sample to a jet of air at 40ºC until a volume was lost the equivalent to exposing the sample for 24 hours in natural conditions. Dispersants were added at the ratio of dispersant to oil of 1:20. Unweathered and weathered oil showed a similar effect of dispersant exposure with Ardrox 6120 after 24 hours, with weathered oil showing 72.6% efficacy and unweathered oil showing 74.9% efficacy. In contrast, Finasol OSR52 performed better on Pyrenees crude oil weathered for 24 hours (73.6% efficacy) compared to unweathered crude (39% efficacy).

### Aircraft Application

Aircraft application for an offshore response provides the ability to treat large volumes of oil over a large area, in a rapid timeframe. Aircraft also can transit quickly to respond and to treat slicks separated over large distances.

Aerial operations are restricted to daylight hours and typically require good visibility, minimum cloud ceiling of 1000 ft, and wind speeds below 35 knots to ensure aircraft and pilot safety. Pilots are responsible for aircraft operations and safety at all times.

Defining a single aircraft and support requirements as a strike team, indicative impact on oil budget per strike team can be derived using the following parameters (based on an air-tractor / crop-duster type aircraft):

- total or daily volume of release
- calculated dispersant volume to treat at initial 1:20 – 1:25 dispersant to oil ratio
- dispersant efficacy on oil is 75% (Intertek Geotech, 2014)
- one fixed-wing aircraft (FWADC) can deliver 3 $m^3$ per sortie
- one Hercules aircraft can deliver 10$m^3$ per sortie
- one aircraft can typically conduct a maximum of 4 sorties per day, reduced to 3 sorties per day, if conducing operations a significant distance offshore)

### Vessel Application

Vessel-based dispersant spray application provides the ability to accurately target oil on the water. However, air support, or the use of drones, allows operators to locate slicks that are difficult to observe from sea level. Smaller amounts of dispersant, or diluted dispersant can be applied based on onsite assessment of efficacy, improving application efficiency.

There are several different systems for vessel-based application and the general considerations for efficient use include:

- mounting of spray arms as far forward as possible to avoid the bow wave moving oil out of the spray path
- nozzles that produce a flat spray of droplets (not mist or fog) that strike the water in a line perpendicular to the direction of vessel movement
- operation of vessel in prevailing wind/weather conditions to avoid overspray onto decks or personnel
- initial (rule of thumb) dispersant-to-oil ratio of 1:20 which can then be adjusted to actual field concentrations based on observed efficacy
- treatment should initially target the outer edges of the thicker portions of any slick rather than through the middle or on thin sheen at surrounding edges.

Defining a single vessel and support requirements as a strike team, indicative capability impact on oil spill budget can be derived using the following parameters:

- total or daily volume of release
- calculated dispersant volume to treat at initial 1:20 dispersant to oil ratio
- dispersant efficacy on oil is 75% (Intertek Geotech, 2014)
- calculated vessels required based on 10 $m^3$ dispersant delivery per 8 hr day per vessel
- number of spray systems per vessel.

Spill modelling undertaken by GHD (2021) on behalf of BHP simulated Surface Dispersant Application (SDA) with the OSCAR response module that included the use of vessels, Fixed Wing Aerial Dispersant Capability (FWADC) aircraft and Hercules aircraft as summarised in Table 6-2. Further, varying mobilisation and operation times for each individual vessel and aircraft were included in the response strategy as summarised in Figure 6-4, including up to 5 vessels, up to 4 FWADC and 1 Hercules.

**Table 6-2: Summary of surface dispersant application mitigation strategy (GHD, 2021)**

| Strategy Element | Vessel/s | Aircraft (FWADC) | Aircraft (Hercules) |
|---|---|---|---|
| **Base of operations (location)** | Exmouth Harbour | Learmonth Airport | Learmonth Airport |
| **Downtime when returned to base (for refuelling etc.)** | 2 hrs | 1 hr | 4 hrs |
| **Daily operation hours** | 12 (daylight only) | 12 (daylight only) | 10 |
| **Cruise speed** | 13 knots | 160 knots | 300 knots |
| **Operational speed (when applying dispersants)** | 5 knots | 90 knots | 150 knots |
| **Dispersant tank size** | 10 $m^3$ | 3 $m^3$ | 10 $m^3$ |
| **Dispersant application rate** | 1:20 | | 1:25 |
| **Dispersant efficacy** | 75% | | |
| **Oil searching strategy** | Thickest oil | | |
| **Minimum thickness threshold for dispersant application** | >50 µm | | |
| **Maximum viscosity threshold for dispersant application** | <10,000 cSt | | |
| **Exclusion zones** | Australian Marine Parks<br>Ningaloo Coast World Heritage Area | | |

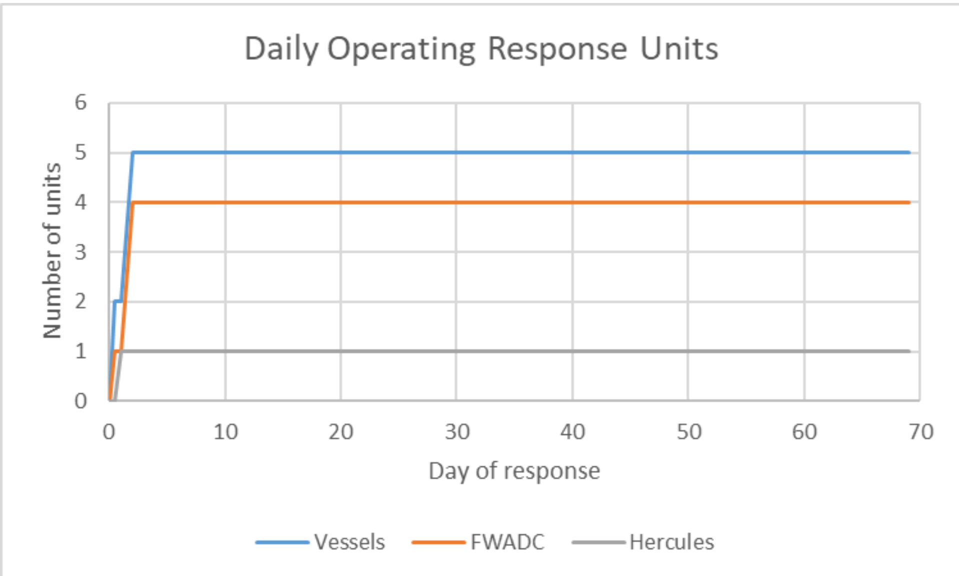



**Figure 6-4: Summary of response asset availability for the SDA plan (GHD, 2021)**

Deterministic spill modelling undertaken by GHD (2021) on behalf of BHP was used to compare unmitigated (69-day LOWC scenario) with SDA (mitigated scenario) against various worst-case modelling realisations. A summary of the potential effectiveness of SDA for two worst-case spill model realisations is presented below.

The SDA simulation for the realisation used to determine the highest accumulated shoreline mass above the moderate threshold (100 g/m$^2$) across all shorelines yielded the following outcomes:

- A total of 102,416 tonnes of surface oil was treated by the response efforts of the FWADCs, Hercules and vessels. The simulated SDA response used 6,365 m$^3$ of chemical dispersant (Table 6-3).
- The SDA implementation yield a substantial predicted reduction in peak loading across all shorelines with a decrease from 11,485 tonnes (unmitigated) to 3,782 tonnes (SDA mitigated). This included substantial reductions of ~3,100 tonnes at Dampier Region, 1,700 tonnes at Dampier Archipelago, 1,600 tonnes at Onslow Region and ~1,600 tonnes at Hedland Region.
- Significant reductions in the total mass of surface oil were also predicted with the reduction in peaks from ~40,000 tonnes (unmitigated) to ~10,000 tonnes (SDA mitigated). This reduction in surface oil was concomitant with an increase in the mass of entrained oil droplets.
- The maximum lineal distance of surface oil greater than 10 µm thickness decreased from ~700 km (unmitigated) to ~350 km (SDA mitigated). Substantial increases in total submerged oil concentrations were predicted within ~200 km of the well from SDA implementation relative to the unmitigated scenario. Dissolved hydrocarbons were also predicted to substantially increase within ~50 km of the well location because of the increase entrained oil and concomitant higher rates of dissolution.
- In summary, the SDA response is predicted to yield substantially environmental benefits in terms of reduced surface oil and shoreline loading. However, there are concomitant increases in entrained and dissolved oil from the SDA response. Peak shoreline loading is predicted to reduce by approximately 33% of the unmitigated load with the SDA response.

The SDA simulation for the realisation used to determine the highest accumulated shoreline mass above the moderate threshold (100 g/m$^2$) at the Ningaloo Region yielded the following outcomes:

- A total of 101,633 tonnes of surface oil was treated by the response efforts of the FWADCs, Hercules and vessels. The simulated SDA response used 6,307 m$^3$ of chemical dispersant (Table 6-4).
- SDA was predicted to yield a substantial reduction in peak loading across all shorelines from 11,050 tonnes (unmitigated) to 6,241 tonnes (SDA mitigated). This included substantial reductions of ~3,000 tonnes at the Ningaloo Region, 1,500 tonnes at the Onslow Region and ~400 tonnes at Barrow Island.
- Substantial reductions in the total mass of surface oil were predicted with reductions from ~30,000 tonnes (unmitigated) to ~10,000 tonnes (SDA mitigated). This reduction in surface oil was concomitant with an increased mass of entrained oil droplets.
- The maximum lineal distance of surface oil exceeding 10 µm thickness decreased from ~400 km (unmitigated) to ~300 km (SDA mitigated). Substantial increases in total submerged oil were predicted within ~200 km of the well relative to the unmitigated scenario. Dissolved hydrocarbon concentrations were also predicted to increase substantially within 50 km of the well location from SDA because of increased entrained oil.
- In summary, the SDA response is predicted to yield significant environmental benefits through reduced surface oil and shoreline loading, but with concomitant increases in entrained oil and dissolved oil. The predicted peak shoreline load of the SDA response is reduced to approximately 44% of the unmitigated load.

### 6.3.3 Subsea Dispersant Injection (SSDI)

In general terms, subsea dispersant injection (SSDI), conducted close to the source, can have a significant impact on the oil spill budget and can provide advantages over surface dispersant application, including:

- application can be continuous regardless of time of day or weather and sea state
- once set up, injection requires less workforce and assets
- efficacy on fresh oil at source is higher, and with increased dispersant mixing due to the turbulent flow in the oil/gas stream, SSDI requires less dispersant (1:100 dispersant to oil ratio typically used for SSDI) providing the ability to treat large volumes of oil with lower volumes of dispersant compared to surface dispersant application.
- sub-surface injection has been shown to significantly reduce volatile organic carbons (VOCs) at surface (e.g., Macondo/Gulf of Mexico incident), increasing safety of responders on waters adjacent to the source of the release.

An indicative capability impact on oil budget can be derived using the following parameters:

- total or daily volume of oil released
- calculated dispersant volume to treat the oil at an initial 1:100 dispersant to oil ratio (AMOSC, 2016; IPIECA-IOGP,2016a), or
- maximum dispersant flowrate at point of injection.

Spill modelling undertaken by GHD (2021) on behalf of BHP simulated the SSDI response plan based upon a more conservative application ratio (dispersant-to-oil) of 1:80 and a dispersant efficacy of 75%, with dispersant injection beginning from day 8 onwards.

SSDI is configured in OSCAR by reducing the oil-water interfacial tension parameter, which has the effect of causing the liquid oil to break up into smaller droplets during release. The oil-water interfacial tension was reduced to 2/3 of the default value on the basis of advice provided by SINTEF to simulate SSDI.

Deterministic spill modelling undertaken by GHD (2021) on behalf of BHP was used to compare unmitigated (69-day LOWC scenario) with SSDI (mitigated scenario) against various worst-case modelling realisations. A summary of the potential effectiveness of SSDI for two worst-case spill model realisations is presented below.

The SSDI simulation for the realisation used to determine the highest accumulated shoreline mass above the moderate threshold (100 g/m$^2$) across all shorelines yielded the following outcomes:

- Undertaking SSDI at an application ratio of 1:80 (dispersant: oil) from day 8 onwards results in the use of 1,545 m$^3$ of chemical dispersant applied to the subsea plume.
- The SSDI resulted in a reduction in the median subsea droplet sizes from 4.39 mm (unmitigated) to 3.69 mm (SSDI mitigated) from day 8 onwards (when the SSDI occurs). The reduced droplet sizes are however still relatively large, which is due to the low energy of the subsea release not providing sufficient turbulent forces to generate very fine droplets. Therefore, the droplets maintain relatively high rates of buoyancy that accumulate on the sea surface in a similar timeframe as the unmitigated scenario.
- Because of the minor reduction in droplet sizes from SSDI, negligible changes in total surface oil mass and entrained oil mass were simulated to the unmitigated scenario.
- The treatment of subsea oil with chemical dispersants slightly increases the droplet surfacing time and alters the simulated transport of oil particles relative to the unmitigated scenario. Oil particles are often transported in different directions depending on if they are subsea droplets (subsea current transport) and surface films (surface current transport). Over a large spatial scale, the transport of surface oil and entrained droplets is broadly similar between the SSDI and unmitigated scenarios. However, localised differences can result in unexpected shoreline loading outcomes, particularly in relative proximity to the well where the effects of SSDI are most pronounced. For example, predicted shoreline loading at the Montebello Islands increased from 663 tonnes (unmitigated) to 1,225 tonnes (SSDI mitigated), and similarly at Barrow Island from 1,612 tonnes (unmitigated) to 2,460 tonnes (SSDI mitigated). Altered transport pathways from SSDI implementation can unexpectedly increase shoreline loading at these proximal receptors. An additional mechanism of increased shoreline oiling

from SSDI implementation is reduced evaporation losses of fresh oil due to the longer duration for smaller droplets to reach the sea surface with a concomitant reduction in exposure time to the atmosphere (where evaporation occurs) prior to becoming stranded ashore. The peak shoreline load across all receptors increased from 11,485 tonnes (unmitigated) to 12,320 tonnes (SSDI mitigated).

The SSDI simulation for the realisation used to determine the highest accumulated shoreline mass above the moderate threshold (100 g/m$^2$) at the Ningaloo Region yielded the following outcomes:

- SSDI at an application ratio of 1:80 (dispersant: oil) from day 8 onwards used of 1,545 m$^3$ of chemical dispersant applied to the subsea plume.
- SSDI reduced the median subsea droplet sizes from 4.39 mm (unmitigated) to 3.69 mm (SSDI mitigated) from day 8 onwards (when SSDI starts). The reduced droplet sizes are still relatively large, which is due to the low energy of the subsea release with resultant relatively large droplets. The large droplets have relatively high of buoyancy and accumulate at the sea surface in a similar timeframe as the unmitigated scenario.
- Therefore, only a minor reduction in droplet size is predicted via SSDI with negligible changes in total surface oil mass and total entrained oil mass relative to the unmitigated scenario.
- The treatment of subsea oil with chemical dispersants can yield a slight change to the resurfacing time and altering of oil transport relative to an unmitigated scenario. Oil particles are often transported in different directions depending on if they are subsea droplets (subsea current transport) and surface films (surface current transport). Over a large spatial scale, the transport of surface oil and entrained droplets is broadly similar between the SSDI and unmitigated scenarios. However slight localised differences near the well in the oil droplet size due to SSDI can have unexpected outcomes. For example, increased shoreline loading is predicted at Ningaloo Region from 7,849 tonnes (unmitigated) to 8,840 tonnes (SSDI mitigated). Altered transport pathways for a small proportion of the spilled oil because of SSDI from day 8 onwards simulates greater loading at the Ningaloo Region receptor. An additional mechanism of increased shoreline oiling from, SSDI implementation is reduced evaporation losses of fresh oil due to the longer duration for smaller droplets to reach the sea surface with a concomitant reduction in exposure time to the atmosphere (where evaporation occurs) prior to becoming stranded ashore. These mechanisms also resulted in some predicted increases in shoreline loading at the other proximal receptors of Thevenard Island and Muiron Islands. The peak shoreline load across all receptors increased from 11,050 tonnes (unmitigated) to 12,799 tonnes (SSDI mitigated).

Overall, SSDI was not effective in reducing predicted environmental impacts for either realisation.

### 6.3.4 Combined Response – (Source Control + SSDI + SDA)

Deterministic spill modelling undertaken by GHD (2021) on behalf of BHP was used to compare unmitigated (69-day LOWC scenario) with a combined response including the source control via capping stack, SDA and SSDI (mitigated scenario) against various worst-case modelling realisations. A summary of the potential effectiveness of a combined response for two worst-case spill model realisations is presented below.

The combined response simulation for the realisation used to determine the highest accumulated shoreline mass above the moderate threshold (100 g/m$^2$) across all shorelines yielded the following outcomes:

- A total of 53,176 tonnes of surface oil was treated by the aircraft and vessels with application of 3,292 m$^3$ of chemical dispersant (Table 6-3). An additional 664 m$^3$ of dispersant was applied to the subsea plume via SSDI operations from day 8 to 25.
- The predicted median subsea droplet size of the subsea plume reduced from 4.39 mm (unmitigated) to 3.69 mm from SSDI.
- As described beforehand, the SDA and source control responses have the greatest effect on reducing shoreline loading. The predicted peak load across all shorelines reduced from 11,485 tonnes (unmitigated) to 3,178 tonnes (combined response), which is 28% of the unmitigated peak load. Shoreline loads were only marginally reduced relative to solely an SDA response, though

the inclusion of source control by day 25 provide reduced shoreline loads at many geographic receptors. Reduced surface oil mass and concomitant increased entrained oil were similar to predictions for the SDA scenario until day 25 (source control), thereafter further reductions in surface oil and entrained oil occur due to cessation of released oil from the well.

- In summary, the combined response for this realisation yielded substantial reductions in shoreline loadings that were marginally more beneficially than solely an SDA response. Further reductions in peak shoreline loading would be expected should the well be capped within 16-days as modelled.

**Table 6-3: LOWC 69 days release realisation #98 – Summary of surface dispersant response for SDA mitigated scenario and all combined mitigated scenario (GHD, 2021)**

| Response Item | SDA Mitigated Scenario | | | All Combined Scenario | | |
|---|---|---|---|---|---|---|
| | Oil Handled (tonnes) | Dispersant Used ($m^3$) | Average Dispersant Applied each Day ($m^3$) | Oil Handled (tonnes) | Dispersant Used ($m^3$) | Average Dispersant Applied each Day ($m^3$) |
| FWADCs | 48,978 | 3,265 | 14.0 | 23,735 | 1,582 | 16.8 |
| Hercules | 34,675 | 1,849 | 31.3 | 19,009 | 1,014 | 42.3 |
| Vessels | 18,763 | 1,251 | 4.3 | 10,432 | 695 | 5.8 |
| Total amount of oil treated with dispersants (tonnes) | 102,416 | | | 53,176 | | |
| Total amount of dispersant used ($m^3$) | 6,365 | | | 3,292 | | |

The combined response simulation for the realisation used to determine the highest accumulated shoreline mass above the moderate threshold (100 g/$m^2$) at the Ningaloo Region yielded the following outcomes:

- A total of 53,518 tonnes of surface oil was treated by the aircraft and vessels with the use of 3,306 $m^3$ of chemical dispersant (Table 6-4). An additional 664 $m^3$ of dispersant is applied to the subsea plume via SSDI operations from day 8 to 25.
- The median subsea droplet sizes in the subsea plume reduce from 4.39 mm (unmitigated) to 3.69 mm (SSDI response).
- As described beforehand, the SDA response has the most beneficial effect via substantive reductions in shoreline loading. The peak load across all shorelines reduced from 11,050 tonnes (unmitigated) to 5,816 tonnes (combined response), which is a 47% decrease of the unmitigated peak load. Shoreline loads were marginally reduced relative to an SDA only response, primarily via earlier source control (by day 25) that provided a minor benefit to some geographic receptors. Reductions in surface oil mass and concomitant increases in entrained oil were similar to those of the SDA scenario until day 25 (start of source control), when further reductions in surface oil and entrained oil were realised through the cessation of the spill.
- In summary, the deterministic simulation with a combined response for this realisation yielded substantial reductions in shoreline loadings that were marginally greater than those by solely an SDA response. However, these results do not fully account for the reduced volumes of hydrocarbon release should the well be capped within 16-days as modelled.

**Table 6-4: LOWC 69 days release realisation #1 – Summary of surface dispersant response for SDA mitigated scenario and all combined mitigated scenario (GHD, 2021)**

| Response Item | SDA Mitigated Scenario | | | All Combined Scenario | | |
|---|---|---|---|---|---|---|
| | Oil Handled (tonnes) | Dispersant Used ($m^3$) | Average Dispersant Applied each Day ($m^3$) | Oil Handled (tonnes) | Dispersant Used ($m^3$) | Average Dispersant Applied each Day ($m^3$) |
| FWADCs | 48,530 | 3,235 | 13.6 | 23,830 | 1,589 | 16.4 |
| Hercules | 35,120 | 1,873 | 31.1 | 19,625 | 1,047 | 41.9 |
| Vessels | 17,983 | 1,199 | 4.3 | 10,063 | 671 | 5.6 |
| Total amount of oil treated with dispersants (tonnes) | 101,633 | | | 53,518 | | |
| Total amount of dispersant used ($m^3$) | 6,307 | | | 3,306 | | |

The results of both combined response simulations indicate that the total volume of chemical dispersants required for SDA is approximately halved by implementing both SDA and capping stack deployment simultaneously. It is anticipated that the total volume of chemical dispersants required to respond would be further reduced should the well be capped within 16-days as modelled.

### 6.3.5 At Sea Containment and Recovery

At sea containment and recovery is the controlled collection and recovery of floating oil from the water's surface. The response typically involves the deployment of booms and oil skimmers from suitable vessels, as well as the collection, transfer and disposal of oil and oily water recovered during the response.

A traditional U-sweep or J-sweep configuration involved two vessels (or one vessel using a para-vane to hold the boom mouth open). The width of the mouth of the boom is typically one third the boom length, therefore ~120 m wide mouth if 400 m of boom was deployed.

Advanced booming techniques require up to 3 to 5 vessels per strike team with advanced booming equipment such as current-busters and speed-sweep systems. These configurations and equipment can operate at higher speeds (up to 5 knots), however have a narrower swath width, typically only 15 - 22 metres (IPIECA-IOGP, 2015a). Advanced booming techniques are useful in scenarios when the slick has spread and fragmented, however targeted operations will typically require some form of air or drone support due to the difficulty of oil on water observation from vessels. Another issue is that current busters have limited oil storage capacity in the pocket, and therefore booming operations must stop, and switch to skimming when the system becomes full. Therefore, the overall encounter rate/oil recovery rate over an operational period may not vary significantly when compared to traditional techniques.

Effective containment and recovery can reduce the potential risks and impact of a marine pollution event associated with:

- marine fauna
- sensitive shoreline environments
- shoreline response
- waste generation.

However, the overall effectiveness of containment and recovery can be limited by a combination of operational constraints which may include but not limited to:

- slick: thickness and percentage cover on surface (affecting the encounter rate)
- slick: state of weathering (how recoverable the oil is with a skimmer)
- weather: suitable weather/sea state conditions and current strengths.

Oil usually needs to be >100 g/m$^2$ (>0.1 mm, which equates to Bonn Code 4/5) to feasibly corral oil with a boom and achieve any significant level, or operationally efficient level, of oil recovery with skimmers during an offshore containment and recovery operation (O'Brien, 2002; IPIECA-IOGP, 2015a).

Continuing containment and recovery operations for slicks noted to be in Code 1, Code 2, and Code 3 (silver/grey sheen, rainbow sheen and metallic sheen respectively) would require consideration of potential recovery rates versus the benefits to the environment, as well as operational risk and cost.

The rate at which the spilled oil can be captured within the boom is known as the encounter rate (IPIECA-IOGP, 2015a), and is a product of the:

- swathe width of the boom configuration
- speed at which the boom is being towed
- thickness and continuity of the oil slick that is being encountered, which may vary due to slick spreading and fragmentation.

It is possible to estimate encounter rates and recovery volumes based on the following: oil thickness x boom opening (which is one third length) x efficiency rate (typically around 10% but could be higher depending on oil type).

Containment and recovery potential calculations provide an indication of the possible impact per strike team on oil spill budget. Calculations can be done on the following basis to indicate a maximum recoverable volume in $m^3$/hr:

- width of boom collecting oil on water (full span width for advanced boom systems such as a Current Buster, or 30% of boom length for conventional Ro-Boom or similar system)
- thickness of oil on water (typically within BONN Agreement Discontinuous True Colour range of between 50 µm and 200 µm)
- rate of travel over water, which is typically a maximum of 0.75 knots for conventional boom, or up to 4 – 5 knots for advanced booming systems (because excess speed over water will result in oil escaping beneath the boom)
- time of operation per day (daylight hours minus deployment time, skimming time (advancing boom systems) or other HSE requirements/constraints).

Two IPIECA-IOGP worked examples for oil spill budget for at sea containment and recovery are provided below. Note, these examples are based on the strike team encountering contiguous oil of 50 µm (minimum containment potential) and 200 µm (maximum containment potential), across the entire mouth of the boom, for the entire duration of an operational period.

- Current buster strike team
  - Equipment Current Buster 4 (National Plan stockpile standard)
  - Encounter width full span (22 m)
  - BONN agreement Discontinuous True Colour Range, 50 µm and 2 knots speed over water (minimum)
  - BONN agreement Discontinuous True Colour Range, 200 µm and 4 knots speed over water (maximum)
  - hr operational period per day
  - Minimum containment potential = 33 $m^3$/day
  - Maximum containment potential = 261 $m^3$/day
- Traditional Ro-Boom strike team
  - Equipment 2 x 200 m lengths offshore Ro-Boom
  - U or J formation with encounter span 30% of total length = 120 m
  - BONN agreement Discontinuous True Colour Range, 50 µm (minimum) and 200 µm (maximum) oil on water
  - Speed over water 0.75 knots
  - hr operational period per day
  - Minimum containment potential = 67 $m^3$/day
  - Maximum containment potential = 267 $m^3$/day

However, based on the constraints listed above, experience has shown that the efficiency of at-sea containment and recovery operations can vary widely, and recovery is usually limited to between 5% and 20% of the initial spilled volume (IPIECA-IOGP, 2015a).

### 6.3.6 In-Situ Burning

In-situ burning requires wave heights typically below 1 m and wind speeds below 10 knots (IPIECA-IOGP, 2016b).

To implement an effective in-situ burn response, a minimum surface hydrocarbon thickness of 2-5 mm (2000 - 5000 g/m$^2$) is required to be present. Booms would be required to corral the spill, to generate additional oil thickness. Therefore, in-situ burning could potentially be attempted in the same locations, on the same slicks as at sea containment and recovery.

The efficiency rates can then be calculated based on the same factors as used for at sea containment and recovery, noting that additional time is then required to conduct the burn itself.

### 6.3.7 Protection of Sensitive Resources

There is no minimum thickness for effective P&D booming (unlike at sea containment and recovery where 100 g/m$^2$ typical thickness is required for reasonable oil recovery volume). Booming at lower floating oil concentrations can still result in a positive environmental outcome, by preventing accumulation over time.

Oil spill budget factors include:

- location specific tidal ranges and current speeds will need to be taken into consideration, to determine potential nearshore/shoreline booming configurations and their potential effectiveness.
- based on potentially effective booming configurations, it is possible to calculate the required lengths of boom and associated ancillaries for specific receptors/locations.
- an estimate would then need to be made regarding the interception rate and recovery rates for nearshore/shoreline oil.

### 6.3.8 Shoreline Response

Shoreline response is one of the final areas to impact the oil spill budget. Clear derivation of the impact is complex considering:

- volumetric changes to the oil over time due to weathering
- bulking factors based on marine or shoreline debris (In consultation with WA DoT, BHP have applied a ‘bulking factor’ for the calculation of potential oil contaminated shoreline waste of 10x the volume of the oil stranded on the shoreline)
- bulking factors introduced through cleaning methods or requirements
- waste management and hazardous waste minimisation.

A ‘rule of thumb’ estimate (IPIECA-IOGP, 2015c) of the impact of shoreline clean-up efforts on oil spill budget is that one person can remove 1–2 m$^3$ per day.

### 6.3.9 Oiled Wildlife Response

Some elements of potential oiled wildlife capability can be evaluated, based on a range of parameters, including:

- location, density, and abundance (and seasonality) of wildlife population(s) potentially at risk from a WCD
- oil types (including weathering properties) and how the fresh versus weathered oil(s) may affect the various wildlife species

- credible response options/tactics for the various species/populations (e.g., comparison of hazing versus pre-emptive capture and translocation versus collection/rescue, intake, first aid/stabilisation, initial clean and rapid release, or full cleaning, long-term rehabilitation, and release).
- the species protection/priority status, and evaluation of the impact of the loss of individual animals on the overall species/population viability, which informs the justification for full cleaning and rehabilitation, versus other treatment/welfare options.

OWR planning should ensure that capabilities are available for the likely/credible OWR options/tactics, based on the evaluation of the key species at risk.

During oiled wildlife cleaning, it is expected that between 600-1,000 L of fresh water may be required to wash and rinse one wildlife casualty. Additional water is required for rehabilitation pools, general cleaning etc. Therefore, the supply of fresh water, and oily water storage is a key consideration.

An overall space requirement of ~2,400 $m^3$, a water flow capacity reaching 60,000 L/day and an electrical load of 200 Amps (for heating, air conditioning etc.) are a conservative estimate for a centre dealing with 100 to 500 wildlife casualties at a cleaning/rehabilitation facility at one time (DBCA, 2014).

## 6.4 Tiered Preparedness

Tiered preparedness is described by the IPIECA-IOGP (2016c) Tiered Preparedness Guideline as:

- Tier 1 capabilities describe the locally held resources used to mitigate spills that are typically operational in nature occurring on or near an operator's own facility.
- Tier 2 capabilities are typically extra resources from regional or national providers, used to increase response capacity or to introduce more specialist technical expertise.
- Tier 3 capabilities are globally available resources that further supplement Tiers 1 and 2. The resources held at the three tiers work to complement and enhance the overall capability by enabling seamless escalation according to the requirements of the incident.

An important concept is the cumulative nature of a tiered response. The elements of a Tier 1 response are supplemented by higher tier capability and not superseded or replaced by it.

The National Plan (AMSA, 2020) identifies three levels of incidents as follows:

- Level 1: Incidents can be resolved through the application of local or initial resources only (e.g., first-strike capacity)
- Level 2: Incidents are more complex in size, duration, resource management and risk and may require deployment of authority resources beyond the initial response
- Level 3: Incidents are characterised by a degree of complexity that requires the Incident Controller to delegate all incident management functions to focus on strategic leadership and response coordination and may be supported by national and international resources.

Combining these two descriptions, for the purposes of BHP response planning, within an Australian context:

- Tier 1 resources are typically being held 'locally'
- Tier 2 are those held regionally (e.g., West coast versus East coast resources) or a portion of the nationally capability
- Tier 3 being full deployment of the national resources, and/or global capability where required.

Table 6-5 presents an example analysis of the equipment/assets which could be deployed for each field response activity under each tier of response in an Australian context.

This table was initially prepared by the Australian Marine Oil Spill Centre (AMOSC) in 2020, as part of an Australian Petroleum Production and Exploration Association (APPEA) IMT training and capability assessment project and is therefore presented below as an indicative/conceptual model only (i.e., this a conceptual model, not endorsed under the NatPlan or any WA Control Agency oil spill contingency plan (OSCP)).

This conceptual model has been developed/presented below, for the purposes of assisting in the consideration of field capability units/strike teams, when conducting the field capability assessment process. BHP have also included a source control capability overview based upon the BHP Source Control Emergency Response Plan (SCERP).

Section 7.3 presents the specific details of tiered capability in relation to a WCD during Pyrenees Infill Drilling activities.

**Table 6-5: Tiered preparedness capability overview**

| Response Strategy | Response Strategy Objective | Capability Requirement Description | Tier 1 Example Criteria | Tier 2 Example Criteria | Tier 3 Example Criteria |
|---|---|---|---|---|---|
| Source Control | Well kill via subsea intervention | MODU / vessel with 'work class' ROV<br>Surface controlled subsurface safety valve (SCSSV) – in situ<br>Blow-out preventer (BOP) – when MODU connected to wellhead<br>Emergency Shut-Down System – MODU or FPSO control room<br>Bullheading production bore (well-specific) – operational MODU in field connected to wellhead<br>AMOSC Subsea First Response Toolkit (SFRT) (located in Henderson Western Australia)<br>Oil Spill Response Limited (OSRL) Subsea Incident Response Toolkit (SIRT) package. | 1x 'Work Class' ROV<br>Surface controlled subsurface safety valve (SCSSV)<br>Blow-out preventer (BOP)<br>Emergency Shut-Down System<br>Bullheading production bore (well-specific) | AMOSC SFRT | OSRL SIRT package |
| | Enable well kill operations. Debris clearance / subsea dispersant injection (SSDI) via Subsea First Response Toolkit (SFRT) | Dynamic Position (DP2) vessel with active heave compensated 20 - 250t crane (depending on debris weight), 400m$^2$ deck space.<br>AMOSC SFRT (located in Henderson Western Australia)<br>OSRL SIRT package. | Nil | AMOSC SFRT<br>Deployment vessel(s) | OSRL SIRT package<br>Deployment vessel(s) |
| | Well capping via Capping Stack System (CSS) | Capping Stack System (ORSL):<br>There are four Capping Stack Systems (CSS) with the approval to mobilise up to two of the available capping stacks in the event of an incident. The CSS are stored fully assembled and maintained in a response ready state for mobilisation and onward transportation by sea and/or air in the event of a source control incident.<br>The CSS are stored at bases strategically located around the globe (15k in Brazil / Norway and 10k in South Africa / Singapore) and all bases have direct deep draft quayside access.<br>Deployment Vessel:<br>DP2 vessel with active heave compensated 130t crane (min), 400 m$^2$ deck space, accommodation (25 POB), and work-class remote operated vehicle (ROV): Min (2) Medium Work Class with capability to reach mud line at incident well centre and survey 50 m radius around well centre Carrying Capacity:100 kg | Nil | Nil | OSRL CSS<br>Deployment vessel(s) |
| | Well kill via relief well | APPEA Memorandum of Understanding: Mutual Aid<br>Alternate MODU plus AHTS vessels<br>Casing and wellhead equipment<br>Consumables<br>Engineering and operational support services | Nil – assumes MODU inoperable | Nil | Alternate MODU – Regional<br>Industry mutual aid resources<br>Alternate MODU – international<br>Specialist well control service providers |
| Surveillance, monitoring and visualisation (SMV) | To collect spill event/response data from a wide variety of sources, to enable informed and timely IMT decision making during a response. | Oil Spill Trajectory Modelling (OSTM)<br>• OSTM will provide predictions of the trajectory and fate of the oil spill<br>• OSTM can be used to predict effectiveness of dispersant<br>• OSTM outputs can be further interrogated to inform health and safety decisions (such as atmospheric risks etc).<br>The capability requirements for OSTM are provided below.<br>• Validated OSTM computer model/program<br>• Trained personnel, on call, to rapidly activate the OSTM. | 1 x OSTM run ordered and received. | 2 or more OSTMs ordered and received over a few days to 1 week. | Multiple daily OSTMs ordered and received over long duration response. |
| | | Aerial surveillance aircraft and trained spotters<br>• aerial surveillance will assist with validating the OSTM predictions, through visual confirmation of the location and type of slick.<br>• personnel trained in aerial observation | 1 x vessel maintaining surveillance. | Opportunistic – primary visual surveillance provided by aerial surveillance. | Opportunistic – primary visual surveillance provided by aerial surveillance. |

PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Response Strategy | Response Strategy Objective | Capability Requirement Description | Tier 1 Example Criteria | Tier 2 Example Criteria | Tier 3 Example Criteria |
|---|---|---|---|---|---|
| | | The capability requirements for Aerial Surveillance are provided below.<br>• Suitable aircraft (fixed or rotary wing)<br>• Trained air observer personnel | (Spill is small enough that vessel surveillance is sufficient to replace planned aerial surveillance) | | |
| | | Vessel surveillance<br>• vessel surveillance will assist with validating the OSTM predictions, through visual confirmation of the location and type of slick.<br>The capability requirements for Aerial Surveillance are provided below.<br>• Suitable vessel<br>• Trained spill observer personnel | 1 x vessel maintaining surveillance.<br>(Spill is small enough that vessel surveillance is sufficient to replace planned aerial surveillance) | Opportunistic – primary visual surveillance provided by aerial surveillance. | Opportunistic – primary visual surveillance provided by aerial surveillance. |
| | | Electronic surface tracker buoys (ESTBs)<br>• ESTBs will assist with validating the OSTM predictions<br>• ESTBs will assist with aerial surveillance flight planning<br>The capability requirements for ESTBs are provided below.<br>• ESTBs<br>• satellite tracking/data reporting platform<br>• suitable deployment platforms (vessels, aircraft etc). | 1-3 x Satellite Tracker Buoys deployed near release location during initial release (first 3-6 hours) only. | Additional ESTBs deployed near leading edge of slick or separately identified slicks that develop over time (Sets of 3 buoys depending on slick leading-edge size) at end of daylight operations.<br>3 - 6 ESTBs deployed. | Routine deployment of clusters of ESTBs deployed near leading edge of slick at end of daylight operations, over multiple days during a long-duration spill event.<br>>6 ESTBs deployed.<br>The need for ongoing deployment of additional ESTBs, or re-deployment of those used previously, would be subject to review based on overall benefit over time. |
| | | Satellite imagery<br>• satellite imagery will assist with validating the OSTM predictions<br>The capability requirements for satellite imagery are:<br>• satellites with suitable spectrum for spill observations<br>• satellite data reporting platform<br>• personnel trained in the interpretation of satellite imagery. | N/A | Single satellite imagery acquisition. | Multiple satellite imagery acquisitions over long duration response, with dedicated imagery interpretation capability also activated. |
| | | Operational Monitoring Programs (part of the OSMP)<br>• provides water quality data and other data to support IMT response decision making<br>The capability requirements for OSMP are:<br>• trained scientific personnel for sampling, data interpretation and reporting<br>• scientific field sampling equipment<br>• logistics platforms (typically small to medium vessels)<br>• laboratories for analysis of samples | Not required if hydrocarbon type known and a sample can be obtained.<br>If spill type is unknown, one or two water quality samples, from in-field vessels if available. | Partial OSMP activation (e.g., water quality sampling only). | Full suite of Operational Monitoring activation (exact program details will be scenario specific, depending on activation triggers). |
| At sea containment and recovery (C&R) | To reduce the volume of oil on the sea surface, resulting in a reduction in the likelihood and/or consequence of impacts associated with floating oil on the sea surface and on potentially impacted shorelines. | The capability requirements for C&R based on key elements of IPIECA-IOGP (2015a) are:<br>• Offshore Contain and Recovery (C&R) basic strike team<br>• 200-400 m offshore boom and skimmer<br>• single large vessel with a rolled stern for boom deployment, and with boom-vane (single vessel operation), or an additional small support vessel for two vessel operations for U-sweep or J-sweep operation<br>• offshore waste storage/transport resources for transport of recovered oil to shore<br>Offshore C&R – Advanced Strike Team<br>• 600 m – 1,000 m offshore boom and skimmer | 1-2 x C&R strike teams (single or two vessel configurations), using locally based C&R equipment and resources. | 3 – 5 x C&R strike teams (single or two vessel configurations)<br>1 – 2 x advanced booming configuration<br>Additional C&R equipment and resources sourced from AMOSC/AMSA stockpiles located in the same region. | 6 or more basic C&R strike teams (single or two vessel configurations)<br>3 or more advanced C&R strike teams<br>Additional C&R equipment and resources sourced from AMOSC/AMSA stockpiles from around Australia. |

| Response Strategy | Response Strategy Objective | Capability Requirement Description | Tier 1 Example Criteria | Tier 2 Example Criteria | Tier 3 Example Criteria |
|---|---|---|---|---|---|
| | | • advanced booming equipment such as current-buster or speed-sweep<br>• U-sweep or J-sweep configuration, or funnel booming arrangements<br>• 3-5 vessel configuration<br>• aerial surveillance (aircraft or drones) to provide information to vessel to enhance encounter rate<br>C&R trained personnel<br>• basic and Advanced booming requires experienced/trained C&R personnel, such as AMOSC Core Group operations team, who can lead/supervise a contain and recover team<br>• vessel deck crews can receive on the job training from appropriately trained C&R team leads<br>• typically, a minimum of 5 deck personnel required for a single basic strike-team; additional teams required for advanced booming configurations | | | International C&R equipment mobilised through National Plan and Global Response Network (through AMOSC/AMSA) (e.g., Oil Spill Response Limited (OSRL) equipment). |
| Surface dispersant application (SDA) - vessels | To reduce the volume of oil on the sea surface, by dispersing it into the water column, resulting in a reduction in the likelihood and/or consequence of impacts associated with floating oil on the sea surface and on potentially impacted shorelines. | The capability requirements for vessel dispersant are provided below, based on key elements of IPIECA-IOGP (2015b).<br>Offshore vessel dispersant strike team<br>• Typical minimum vessel specs for offshore vessel dispersant would include:<br>• single vessel (minimum 15-20 m length – depending on operating environment and expected sea conditions)<br>• deck space for IBCs or single 10 m3 ISO-tank<br>• dispersant spray systems, such as fixed booms or AFEDO units<br>Dispersant application trained personnel<br>• personnel trained in vessel -based dispersant application<br>• minimum 2 x trained operator + 2 deck crew | Single vessel dispersant spraying strike team using locally based dispersant equipment & local dispersant stockpile. | 2 – 4 vessel dispersant spraying strike teams on station.<br>Some dispersant equipment/stocks shifted to site from AMOSC/AMSA stockpiles located in the same region. | 5 or more vessel dispersant spraying strike teams on station.<br>Large scale dispersant equipment/stocks shifted to site from AMOSC/AMSA stockpiles around Australia.<br>Equipment/dispersant stocks sourced and imported from overseas third-party suppliers.<br>Possible activation of Global Dispersant Stockpile – Singapore, Americas, Middle East & Europe.<br>Just in time dispersant manufacture considered /actioned (Nalco/Chemetell/Dasic/Total Fluids) |
| Surface Dispersant - Fixed wing aerial dispersant (FWAD) | To reduce the volume of oil on the sea surface, by dispersing it into the water column, resulting in a reduction in the likelihood and/or consequence of impacts associated with floating oil on the sea surface and on potentially impacted shorelines. | The capability requirements for aerial dispersant using air-tractors (AT) are based on the AMOSC Fixed Wing Aerial Dispersant Operations Plan (FWAD Ops Plan) (AMOSC, 2020) which contains the overarching national fixed wing arrangements, as well as AMOSC regional Aerial Operations plans specific to each state/region.<br>A FWAD air-tractor offshore strike team would consist of:<br>• Air tractor(s) – single pilot<br>• Air Attack Supervisor Platform (helicopter preferred over fixed wing aircraft), trained Air Attack Supervisor, and Aircraft Loading Officer.<br>• Search and Rescue platform (vessel or aircraft)<br>The FWAD airbase support requirements outlined in the FWAD Ops Plan consists of all the elements required to effectively manage airbase operations in support of Aerial Dispersant Application including:<br>Suitable runway/airstrip with:<br>• operations/coordination room<br>• office facilities – internet, fax, telephone<br>• catering facilities / Amenities – toilets, kitchen, eating room<br>• access arrangements – 24/7<br>• security arrangements – equipment, operations room, airfield<br>• availability of bulk water<br>• vehicle access – truck, 4wd, car, bus<br>• storage for equipment<br>Additional details confirmed through the Airport Operations Manager or Aerodrome Reporting Officer including:<br>• refuelling facilities and arrangements – bulk, drums, truck | 1 x Air Tractor (AT) aircraft on station; 1-3 sorties from FWAD.<br>Delivery of up to 10 $m^3$/day. | 2 – 6 AT aircraft on station; multiple sorties (4 – 24 sorties/day).<br>Delivery of up to 77 $m^3$/day. | >6 AT aircraft,>24 sorties/day.<br>Potential for activation of Global Response Network internationally available aircraft – 727, 737 & L-382 aircraft (OSRL and other providers).<br>Delivery of >77 $m^3$/day.<br>Equipment/dispersant stocks sourced and imported from overseas third-party suppliers.<br>Potential for activation of Global Dispersant Stockpile – Singapore, Americas, Middle East & Europe.<br>Potential for activation of agreed 'just in time' dispersant manufacture considered / actioned (Nalco/Chemetell/Dasic/Total Fluids) |

| Response Strategy | Response Strategy Objective | Capability Requirement Description | Tier 1 Example Criteria | Tier 2 Example Criteria | Tier 3 Example Criteria |
|---|---|---|---|---|---|
| | | • identification of fuel requirements of aircraft – JET A1/AVGAS<br>• identification of availability and transfer arrangements for refuelling<br>• emergency service arrangements – fire, ambulance, rescue, hospital<br>• transport arrangements for airbase personnel – distance from town<br>Dispersant stockpiles would be mobilised to meet aircraft at the appropriate location. Timeframes are:<br>• third-party trucking provided within 4 hrs of activation<br>• estimated vehicle loadout = 90 mins per vehicle | | | |
| Offshore subsea dispersant injection (SSDI) | To reduce the volume of oil floating up to the sea surface, by dispersing it at the seabed, resulting in a reduction in the likelihood and/or consequence of impacts associated with floating oil on the sea surface and on potentially impacted shorelines. | The capability requirements for subsea chemical dispersant injection are provided below. In conjunction with AMOSC the Australian offshore oil and gas industry has established the Sub-Sea First Response Toolkit (SFRT) which as capable of clearing the wellhead as well as allowing sub-sea dispersant injection. The equipment is housed and maintained in Fremantle by Oceaneering and requires the following to assist in mobilisation and deployment:<br>• large support vessel with 750 $m^2$ deck space, tote tank storage capacity, active heavy compensated 20t (min) crane, and work-class remote operated vehicle (ROV): Min (2) Medium Work Class with capability to reach mud line at incident well centre and survey 50 m radius around well centre Carrying Capacity:100 kg<br>Included in the SFRT or available once deployment has been arranged are:<br>• dispersant injection wands and associated dispersant injection equipment including pumping manifolds and downlines<br>• access to the AMOSC Fremantle based 500 $m^3$ SSDI dispersant stockpile plus additional industry stockpiles<br>Secondary additional resources available from OSRL (SWIS subsea dispersant system) | nil | AMOSC SSDI equipment including 500 $m^3$ dispersant stockpile and injection equipment mobilised (as part of the AMOSC Subsea First Response Toolkit).<br>OSRL (SWIS subsea dispersant system) including ancillary equipment<br>Equipment/dispersant stocks sourced and imported from overseas third-party suppliers.<br>Potential for activation of Global Dispersant Stockpile – Singapore, Americas, Middle East & Europe.<br>Potential for activation of agreed 'just in time' dispersant manufacture considered/actioned (Nalco/Chemetell/Dasic/Total Fluids) | |
| SSDI Monitoring https://www.oilspillprevention.org/-/media/Oil-Spill-Prevention/spillprevention/r-and-d/dispersants/api-1152-e1-industry-recommended-subsea.pdf | Operational efficacy monitoring to inform IAP | Small support vessel with ROV capability for operational monitoring – water quality, including towed fluorometer, including trained water quality scientists.<br>Real-time VOC monitoring equipment (e.g., photoionization detector, colorimetric tubes, etc.) and trained users will be stationed on vessels located near the well site.<br>Air sampling for specific hydrocarbon constituents, including BTEX, PAHs, and other hydrocarbons, by integrated air sampling with multi-sorbent thermal desorption tubes or worker badges, followed by gas chromatography mass spectrometer (GC-MS) analysis (via NIOSH Method 2549 or equivalent method)<br>Laboratory analysis<br>ROV with video cameras for plume analysis<br>Aerial surveillance - helicopters, fixed-wing systems, unmanned aerial systems (UAS), satellites, and tethered balloons. | Nil | SLA with OSRL including access to Subsea Intervention Response Toolkit (SIRT) & dedicated monitoring equipment.<br>CSA Ocean Sciences monitoring services via OSRL framework agreement. | |
| Controlled in-situ burning | To reduce the volume of oil on the sea surface, resulting in a reduction in the likelihood and/or consequence of impacts associated with floating oil on the sea surface and on potentially impacted shorelines. | The capability requirements for in-situ burning, based on key elements of IPIECA (2016b) are:<br>• appropriate support vessels for deployment and management of fire rated containment boom<br>• smaller vessels to facilitate ignition, recovery of burn residue, standby fire safety, and transport of personnel and equipment<br>• fire-retardant booms (from international stockpiles)<br>• incendiary devices<br>• trained personnel from Global Response Network (e.g., Marine Spill Response Corporation (MSRC), OSRL) | nil | nil | Overseas provision of fire boom and trained responders from overseas providers. (OSRL, MSRC and others.) |

**PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT**

<table>
<tr><th>Response Strategy</th><th>Response Strategy Objective</th><th>Capability Requirement Description</th><th>Tier 1 Example Criteria</th><th>Tier 2 Example Criteria</th><th>Tier 3 Example Criteria</th></tr>
<tr><td rowspan="3">Protection and deflection (P&D) of sensitive resources</td><td rowspan="3">To prevent/reduce the volume of oil on entering a sensitive habitat, resulting in a reduction in the likelihood and/or consequence of impacts associated with floating oil on the values and sensitivities of the habitat.</td><td rowspan="3">The capability requirements for a single protection of sensitive resources/protect & deflect (P&D) strike team include:<ul><li>100 m – 200 m shore-seal boom (4 to 8 x 25 m, +50 kg lengths)</li><li>200 m – 400 m nearshore boom and associated ancillaries (shoreline and nearshore anchor kits, sandbags etc) (8 to 16 x 25 m, +50 kg lengths)</li><li>1 - 2 x small, typically shallow draft support vessel</li><li>1 – 4 x Light vehicle(s)/Utility Task Vehicle (side by side UTV)</li><li>1 x skimmers / oil recovery devices suited for nearshore/shoreline environment</li><li>4 – 8 x nearshore anchor kits</li><li>(optional) 1,000 – 4,000 sandbags</li><li>onshore solid and liquid waste management resources</li><li>trained responders (2 minimum)</li><li>general labour personnel (8 minimum)</li></ul>Once P&D boom is deployed and in place it will require monitoring and potential adjustment over changes in tide and weather/wind/sea state. This can be achieved with a reduced number of personnel, the remainder of which can be redeployed to alternative activities.</td><td rowspan="3">1 – 2 shoreline-based sensitivities protected (shoreline/nearshore booming)<br>1 – 2 P&D strike teams (establish booming and monitor)</td><td>5 – 16 shoreline-based sensitivities protected<br>3 – 8 P&D strike teams (establish booming and monitor)<br>Regional equipment stockpiles mobilised.</td><td>>16 sensitivities protected<br>>8 shoreline protection strike teams<br>National stockpiles of equipment mobilised.</td></tr>
<tr><td>1-2 x remote P&D operations.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or marine FOB).<br>Responders required to camp / stay overnight on a support vessel.</td><td>>2 remote P&D operations.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or marine FOB).<br>Responders required to camp / stay overnight on a support vessel.</td></tr>
<tr><td colspan="2">*Note: ‘Remoteness’ and ‘isolation’ are triggers for an escalation in tier. This is based on (1) the time frames for operators to execute this tactic and (2) to reflect the complexity of these operations with resources drawn from outside the immediate region.</td></tr>
<tr><td>Shoreline clean-up assessment technique (SCAT)<br>(SCAT – including oiled wildlife reconnaissance).</td><td>To systematically collect data about the location, nature, and degree of shoreline oiling, (including at risk/impacted wildlife), to inform shoreline treatment and oiled wildlife response planning.</td><td>The capability requirements for an individual SCAT team are provided below, based on key elements of IPIECA (2015c).<br>A single SCAT team will typically consist of:<ul><li>1 or 2 x trained SCAT specialist</li><li>1 x trained oiled wildlife expert/advisor</li><li>1 x indigenous heritage advisor/ranger and/or 1 x local government ranger</li><li>4x4 vehicle or utility task vehicle (side by side UTV)</li><li>SCAT data recording platform/tools</li><li>potential for 1 x drone and drone-operator for locations with restricted access</li></ul>Trained SCAT and wildlife personnel are available from industry/AMOSC as well as individual states via National Response Team (NRT) arrangements. Indigenous SMEs and local knowledge specialists are available through the states.</td><td>1 SCAT team<br><10 km shoreline to survey</td><td>2 – 10 SCAT teams<br>>10 – 100km shoreline to survey, OR,<br>Complex shorelines (Environmental Sensitivity Index (ESI) 1 or 2, ESI 6 – 10)<br>AMOSC Core Group (CG), Government Control Agency staff<br>NRT members from other jurisdictions<br>Expanded multi-agency response including multiple state Gov. agencies.<br>1-2 x remote SCAT operations.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or Marine FOB).<br>Responders required to camp / stay overnight on a support vessel.</td><td>>10 SCAT teams<br>>100km of shoreline to survey OR,<br>Complex shorelines (ESI 1 or 2, ESI 6 – 10), and/or,<br>Full deployment of industry / AMOSC and NRT resources<br>Potential for mobilisation of Global Response Network personnel to SCAT teams from OSRL and other third parties.<br>>2 remote SCAT operations.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or Marine FOB).<br>Responders required to camp / stay overnight on a support vessel.</td></tr>
</table>

**PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT**

<table>
<tr><th>Response Strategy</th><th>Response Strategy Objective</th><th>Capability Requirement Description</th><th>Tier 1 Example Criteria</th><th>Tier 2 Example Criteria</th><th>Tier 3 Example Criteria</th></tr>
<tr>
<td rowspan="3">Shoreline clean-up</td>
<td rowspan="3">To reduce the volume of oil on shoreline, to reduce the likelihood/consequence of impacts on the values and sensitivities of the shoreline and promote/increase the speed of the natural recovery of the shoreline to its pre-oiled state.</td>
<td rowspan="2">The capability requirements for the Shoreline Clean-up element of the Shoreline Response Program below are based on key elements of IPIECA Shoreline Response Programme Guidance (IPIECA-IOGP, 2020) and are for one individual shoreline response clean-up team.<br>• 1 x Trained Responder (as shoreline clean-up Team Lead)<br>• 7 - 10 x labour hire personnel (on the job training)<br>• manual clean-up tools (rakes, shovels, hand trowels, etc)<br>• oily waste storage containers (Heavy duty plastic bags)<br>• potentially 1 x small machinery (e.g., rubber tracked bobcat) or tray back all-terrain vehicle to transport recovered oily waste to centralised temporary hazardous waste storage<br>• ablutions and welfare facilities for personnel<br>• decontamination resources (additional personnel and equipment)</td>
<td rowspan="2">Day 0 – day four<br>Immediate deployment and mobilisation with the aim of having team/s on the ground within 96 hrs.<br>1-2 x shoreline clean-up teams<br>10 – 20 $m^3$ oily waste recovered per day<br>Resources from local area.</td>
<td>Day four – day seven<br>3 – 10 shoreline clean up teams<br>30 – 100 $m^3$ oily waste recovered per day<br>Potential inclusion of advanced clean-up techniques including high volume / low pressure flushing, surf washing, mechanical equipment.<br>Resources and equipment from within the region from industry, AMOSC/CG, labour contracting entities and other mutual aid, NRT.</td>
<td>Week three onwards<br>>30 shoreline clean up teams<br>>300 $m^3$ oily waste recovered per day<br>Potential inclusion of advanced clean-up techniques including high volume / low pressure flushing, surf washing, mechanical equipment.<br>Potential for resources from non-spill sector (Defence, volunteer groups) with just-in-time training and provisioning<br>National Plan resources and equipment from industry, AMOSC/CG, labour contracting entities and other mutual aid and NRT.<br>Potential for mobilisation of Global Response Network equipment and resources.</td>
</tr>
<tr>
<td>1-2 x shoreline clean-up teams operating at a single remote/isolated shoreline.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or Marine FOB) or air.<br>Responders required to camp / stay overnight on a support vessel.</td>
<td>>2 x shoreline clean-up teams operating at multiple remote/isolated shorelines.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or Marine FOB) or air.<br>Responders required to camp / stay overnight on a support vessel.</td>
</tr>
<tr>
<td>Escalation of shoreline clean-up response will require utilisation of forward operating base (FOB) for the purpose of coordination and support.</td>
<td>Level 1<br>• single marquee<br>• 1 x FOB team leader or Sector Command<br>• 1 x medic (also providing admin support).</td>
<td>Level 2<br>• larger FOB base set-up<br>• FOB Manager<br>• 1-2 x shoreline division commanders<br>• 1-2 admin assistants<br>• 4 – 8 Sector Commanders<br>• 1 x health & safety rep<br>• 1 x medic<br>• 1 x logistics/catering coordinator<br>• 1 x waste management coordinator</td>
<td>Level 3<br>• very large FOB set-up<br>• FOB Manager<br>• 3+ x shoreline division commander<br>• 3+ x deputy commanders<br>• 3+ x admin assistants<br>• 8+ x sector commanders<br>• 3+ HSE reps<br>• 2+ medics<br>• 2+ logistics/catering<br>• 1-2 waste management coordinators<br>• 1-2 Information Technology (IT)/communications specialists</td>
</tr>
</table>

| Response Strategy | Response Strategy Objective | Capability Requirement Description | Tier 1 Example Criteria | Tier 2 Example Criteria | Tier 3 Example Criteria |
|---|---|---|---|---|---|
| Oiled wildlife response<br>(OWR) | To minimize the impact of an oil spill on wildlife by both prevention of oiling where possible and mitigating the effects on individuals when oiling has taken place (IPIECA-IOGP, 2014). | The capability requirements for an individual OWR collection & transport team are provided below, based on key elements of IPIECA-IOGP (2017b) and WA DBCA (2014).<br>• 2-4 x trained OWR personnel<br>• 1 x OWR collection kit (for capture and transport of oiled wildlife)<br>• 1 x vehicle<br>The capability requirements for an individual wildlife cleaning/rehabilitation team are provided below, based on key elements of IPIECA-IOGP (2017b) and WA DBCA (2014).<br>• Wildlife treatment/rehabilitation team would typically consist of:<br>• 1 x OWR container<br>• 5 x trained OWR personnel<br>• 10 x labour hire personnel<br>• 2 x trades persons (electrician, plumber etc., to set-up of OWR container)<br>• liquid and bio-hazard oily waste storage<br>The capability requirement for wildlife hazing typically includes:<br>• vessel air-horns, vessel water cannons etc.<br>• acoustic deterrents/bird scaring devices, deployed onshore or from a vessel<br>• visual deterrents<br>• physical barriers/structures. | As per State Plan - level one and two state response<br>Localised resources (Operator + government + AMOSC) | State plan levels three and four<br>Localised +State + National<br>Mutual aid | Level five and six (and multiples of)<br>+ international<br>+ complexity of animal oiling |
| | | | | 1-2 x OWR collection/transport team operating at a single remote/isolated shoreline.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or Marine FOB) or air.<br>Responders required to camp / stay overnight on a support vessel. | >2 x OWR collection/transport teams operating at multiple remote/isolated shorelines.<br>Isolated island or remote operations required – access only via vessel (>2 hours travel from port or Marine FOB) or air.<br>Responders required to camp / stay overnight on a support vessel. |
| Oil contaminated waste management | To limit the environmental impacts including secondary contamination associated with the transport and disposal of the collected oily waste products (liquids, solids, biohazard, etc.). | The capability requirements for tertiary waste collection are provided below, based on the key elements of IPIECA-IOGP (2016d) Oil Spill Waste Management and Minimisation.<br>• waste management planning (aims, objectives, processes, and procedures)<br>• waste collection and storage<br>• waste transportation including licensed hazardous waste transport trucks (vacuum trucks, solid contaminated waste transport trucks etc.)<br>• pre-treatment, treatment, and final disposal, (e.g., licenced onshore tertiary waste treatment facilities (landfill, soil remediation, incineration facilities etc.) | <20 $m^3$/day of solid/liquid/biohazard oily waste, transported to licenced tertiary waste treatment/disposal facility. | 20 – 100 $m^3$/day of solid/liquid/biohazard oily waste, transported to licenced tertiary waste treatment/disposal facility. | >300 $m^3$/day of solid/liquid/biohazard oily waste, transported to licenced tertiary waste treatment/disposal facility. |

IPEICA-IOGP (2016c), encourages contingency planning to be undertaken in a manner which not only examines the tiers of capabilities through single distinct levels (e.g., as represented in Section 7), but also, to evaluate and illustrate where the resources could/should be sourced from to fulfil risk mitigation aims. The identification of individual/discrete capabilities that may be required for oil spill response enables a much more specific and tailored representation of response capability matched to each operation/risk.

Thus, the response capability required is unique to all operations and locations, with each situation being shaped by both setting and operational factors which not only affect the risk profile but also influence how resources will be provided. Each response strategy/capability can be considered independently, and the planning process can consider at least the following four determining factors:

- inherent operational-specific risks (e.g., the oil type, inventory, and related release scenarios)
- location-specific risk (e.g., the proximity of oil-sensitive environmental receptors)
- relative proximity and access to supporting resources and their logistical requirements, and
- applicable legislative requirements or stipulated regulatory conditions.

Each of these factors may influence the provision of response resources/capabilities across the range of response strategies, which can then be presented in the form of a unique pictogram (or tiered preparedness wheel) for any operation.

Once completed, the model/tiered preparedness wheel provides a simple visual representation of the response capabilities that are available and how they can be combined to provide the capacity required to mitigate the risk identified for each operation or location. A non-specific example of this model is provided in Figure 6-5.

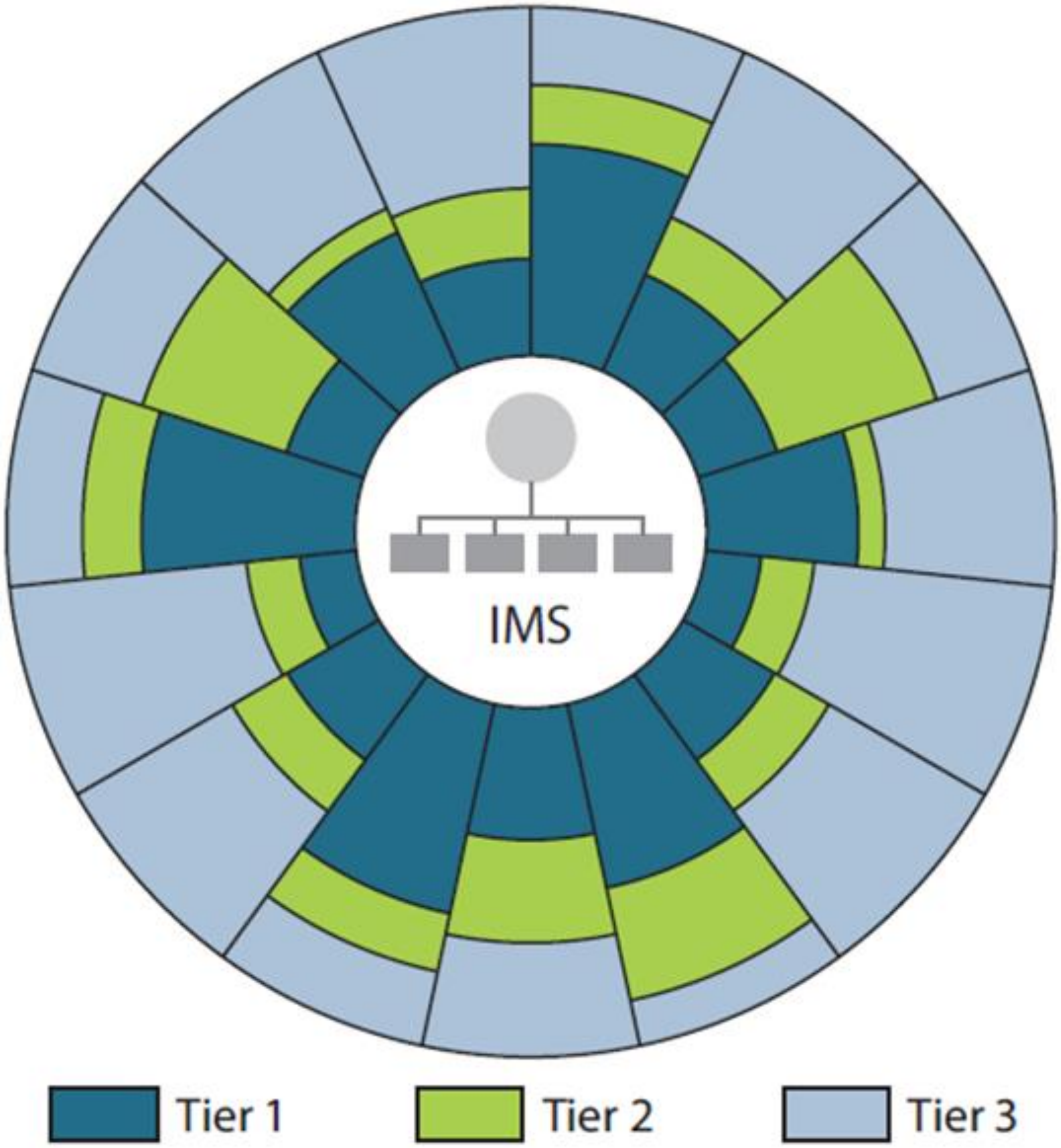



**Figure 6-5: Example tiered preparedness wheel (IPIECA-IOGP, 2016c)**

The IPIECA-IOGP (2016c) tiered preparedness evaluation process described above is considered appropriate, not only for individual petroleum titleholder operations, but also for regional response planning. Within a region/hydrocarbon exploration/production basin, there are inherent similarities in the four determining factors described by IPEICA-IOGP (2016c). For example, consistency in oil types and release scenarios, similar location specific risks and environmental sensitivities, similar logistical challenges and all are operating within the Australian NatPlan and OPGGS (E) regulatory environment.

Using the tiered preparedness wheel concept, an OPEP-specific tiered capability overview is provided in Table 6-6. This table defines the Tier, (1, 2 or 3), the target operational timeframe within which the capability should be able to be mobilised, to achieve the response strategy objective, and the geographic location in which the capability should be located, to enable the mobilisation of the response capability within the target timeframe.

**Table 6-6: OPEP tiered capability overview**

| Tier | General Description | Target operational timeframe | OPEP capabilities and locations |
|---|---|---|---|
| Tier 1 | Area / region specific resources, typically able to be activated quickly, mobilised (enroute to site) and/or on location and operationally within 12 – 48 hours. | <48 hours | BHP contracted offshore facilities and vessels<br>• dispersant stockpiles and spray equipment – Pyrenees FPSO<br>• logistics assets (vessels/aircraft)<br>Exmouth / Dampier<br>• AMOSC Tier 1 stockpile<br>• BHP Tier 1 stockpile<br>• Logistical assets (vessels)<br>Learmonth<br>• Forward Operating Base<br>• Logistical assets (aircraft) |
| Tier 2 | Regional resources require air or land movements to FOB, deployed and infield operationally within 48-96 hours (operationally active during days three to four). | 48 – 96 hours | AMOSC & AMSA NW Shelf and Fremantle based equipment stockpiles (including SFRT).<br>NW Shelf/Fremantle logistics assets (vessels/aircraft).<br>AMOSC Core Group within WA.<br>WA Control Agency personnel |
| Tier 3 | National or international resources, operational in the field from day four onwards*. | >96 hours | Australian east-cost and international (BHP / OSRL / WWC) based equipment stockpiles, logistics assets and personnel (including Capping Stack System / SIRT)<br>APPEA MoU: Mutual Aid resources<br>Internationally sourced MODU / vessels on open market |

*Pending COVID Readiness

# 7 Field Capability Arrangements and Environmental Risk Assessment of Response Strategies

This section provides:

- Details of standing oil spill response arrangements BHP may access during an oil pollution emergency event; and
- Detailed field capability assessments for selected response strategies based upon response planning thresholds (Table 4-2), oil spill modelling results (Section 4.3), and basis of assessment information detailed within Section 6.

## 7.1 Standing Oil Spill Response Arrangements

This section provides an overview of general resourcing arrangements in place to undertake and emergency oil pollution response. In line with BHP Crisis and Emergency Management arrangements, BHP has established formalised third-party contracts and agreements with defined performance standards/criteria for the provision of resources, services or equipment in support of emergency response activities. These resources will be activated, dispatched and deactivated prior to and during an emergency.

Activation protocols to initiate each of these arrangements is presented within the *Pyrenees Phase 4 Infill Drilling Program Oil Pollution Emergency Plan* (OPEP) (BHPB-04PY-N950-0022)

Capability to initiate and resource the BHP IMT and WA DoT IMT is presented within the *APU Incident Management Team (IMT) Capability Assessment Report* (AOHSE-ER-0071).

### 7.1.1 OSRO Arrangements

BHP maintains contracts with a number of Oil Spill Response Organisations (OSROs). Whilst these OSROs have capability to provide technical specialists to supplement the BHP IMT, OSRO resources also include trained personnel to lead Field Response Teams and provide access to industry response equipment. The main relationships are detailed in the sub-sections.

#### 7.1.1.1 Australian Marine Oil Spill Centre (AMOSC)

The Australian Marine Oil Spill Centre (AMOSC) is an industry funded oil spill response facility based in Geelong, Victoria. AMOSC resources include:

- AMOSC spill response equipment stored at AMOSC and at other locations;
- Oil company equipment based at various locations; and
- Trained industry response ("Core Group") personnel.

BHP is a full member of AMOSC and as such has access to industry equipment and personnel via the APPEA Memorandum of Understanding: Mutual Aid and National Plan equipment held as part of the contingency plans of the Australian Oil Industry and the Australian Government. AMOSC require confirmation from mobilisation authorities to access equipment listed under the National Plan.

All National Plan, AMOSC and those industry equipment resources that are registered with AMOSC, which are potentially available for response to an incident, are listed in the Marine Oil Spill Equipment System (MOSES) database. The MOSES database is a computer database that lists the type, quantity, location, status and availability of pollution control equipment. It is also used to manage audits, maintenance and repair of AMSA-owned equipment (Appendix A – Industry Response Equipment).

Normal requests for assistance are directed to AMOSC in Geelong to coordinate, but equipment may also be accessed through the MOSES database, or AMSA – Marine Environmental Protection Services (MEPS).

AMOSC (and AMOSC Core Group members) form part of BHP's First Strike and primary response strategy to a spill. Under Covid-19 restrictions, AMOSC IMT support may be facilitated remotely. Only nominated BHP personnel can request the assistance of AMOSC (see *APU Emergency Contact Directory, AOHSE ER-0002-005*) and this is usually conducted via the Perth IMT.

**Table 7-1: AMOSC advice levels**

| AMOSC Advice Level | Status | AMOSC Requirements |
|---|---|---|
| Level 1 | Forward Notice | Advise a potential problem.<br>Provide or update data on oil spill.<br>Update information on spill and advise 4 hourly. |
| Level 2 | Standby | AMOSC resources may be required.<br>Assessment of resources and destination to be made.<br>Update information on spill and advise 2 hourly. |
| Level 3 | Callout | AMOSC resources are required.<br>Detail required resources and destination. |

The AMOSC Core Group is an Australian industry initiative that was initially crafted in 1992. It is unique within the international context and is noted for being innovative and effective to rapidly expand and surge well trained personnel into a spill response. The AMOSC Core Group has attended most Australian-based spills and also several offshore spills.

The AMOSC Core Group has around 30-40 IMT personnel and 50-70 field operators.

AMOSC Core Group policy requires all Core Group personnel to undertake initial training, followed by competency re-validation/training every 2 years.

Typically, AMOSC manage the Core Group re-validation/training by conducting 3 x 1 week Core Group training/workshops per year.

AMOSC coordinates the routine testing, monitoring and monthly reporting of Core Group personnel availability.

The AMOSPlan will be activated by BHP when the response to an oil spill incident is regarded by BHP as requiring resources beyond those of the company itself.

In the event that the oil spill response requires the call out of AMOSC's own resources, the call out request is made directly to AMOSC by the Perth IMT.

Should the response require mutual aid from equipment owned and personnel employed by another company, the request for assistance is made directly company to company via each company's nominated Mutual Aid Contact.

In addition, BHP will also be required to contact AMOSC to activate the Standing Agreement (92032701.WP5) and the Service Contract (for the borrowing company), in the event that BHP require equipment from another company.

Current AMOSC equipment stock listing is detailed within Appendix A – Industry Response Equipment.

#### 7.1.1.2 Oil Spill Response Limited (OSRL)

BHP is a member of the OSRL group. OSRL have capacity to mobilise additional equipment and personnel to APU from their Singapore location. Only nominated BHP personnel may request the assistance of OSRL via the IMT Leader under OSRL's Service Level Agreement (SLA).

The OSRL service level statements provides for:

- 24/7 call-out arrangements.

- Guaranteed initial response from OSRL of five technical support personnel (IMT or field personnel) for 5 days.
- Surge to 18 OSRL personnel, upon request from the BHP IMT.
- Depending on size/complexity, OSRL maintain 80 response team personnel globally, who are potentially able to be provided to support an ongoing Level 3 event, on a best-endeavours basis.

OSRL service level statement defines the types of services provided by the 18-person surge capability as:

- Technical advice and incident management coaching within the command centre.
- Development of an Incident Management Plan.
- Tier 1 / 2 equipment readiness and training of contractors.
- In-country logistics planning and support for inbound equipment.
- Impact assessment and advice on response strategy selection.
- SCAT and aerial surveillance / quantification surveys.
- Tactical response planning.

OSRL also has a Memorandum of Understanding (MoU) with AMOSC, and OSRL may also be activated by AMOSC to provide resources to AMOSC to respond to a situation. Following initial spill notification, OSRL may be mobilised if required within 8 hours (pending COVID-19 restrictions).

Updates on the availability of OSRL’s equipment availability is provided via a weekly Equipment Stockpile Status Report from OSRL’s website at:

http://www.oilspillresponse.com/activate-us/equipment-stockpile-status-report

The Equipment Stockpile Status Report provides a quick and timely overview of the availability of OSRL’s equipment stockpile globally and is especially useful in assuring OSRL’s readiness. It also provides a vital overview of the resources that BHP would be able to access in the event of a spill. Under OSRL's Service Level Agreement (SLA), the first member who initiates mobilisation of OSRL will be entitled to a maximum 50% of the stockpile, while the second member is entitled to a maximum 50% of the remaining stockpile (and so on).

In addition to the Equipment Stockpile Status Report, OSRL provides a response equipment list that provides an overview of the size, type and ancillaries required for the equipment that is available at their bases. To ensure efficient and timely response capability, OSRL also have also pre-packaged some of the equipment into loads ready for dispatch, that are suitable for general spill situations and operating environments.

The equipment list can be accessed via the link below:

http://www.oilspillresponse.com/files/OSRL_Equipment_List.pdf

In addition to providing response equipment, OSRL also supply a selection of ground staff who have the practical skill and experience to assist and support BHP in a spill response and are trained in using the Incident Command System (ICS) structure. Response teams will comprise:

- Team Manager;
- Operations Manager; and
- Senior technicians/ technicians.

OSRL can be called upon to provide immediate technical advice and begin to mobilise personnel if required. OSRL would be called on to lead small specialist teams and/or provide supplementary labour and equipment if ongoing response is required. Only nominated BHP personnel may request the assistance of OSRL via the IMT Leader.

OSRL also has a Memorandum of Understanding (MoU) with AMOSC, and OSRL may also be activated by AMOSC to provide resources to AMOSC to respond to a situation. Following initial spill notification, OSRL may

be in a state of readiness to mobilise within 8 hours. Actual mobilisation of OSRL will be dependent on any international travel restrictions at the time of the incident.

### 7.1.2 Technical Support (Environmental Monitoring)

BHP maintains a list of pre-approved vendors (OSM Service Providers) who can be called upon at short notice to provide environmental monitoring services in the event of an oil spill.

The BHP Contractor Assurance Program is managed through 1SAP (Maintenance Plan No. 30828237). The scope of the assurance program is to ensure completion of the annual OPEP contractor capability assessment to meet the requirement to maintain oil spill preparedness. Maintenance Plan Task 1.3 includes contacting environmental monitoring vendors to obtain information about personnel, location, qualifications and skill set. In addition, Maintenance Plan No. 30884994 includes a quarterly verbal check with each vendor about availability to mobilise in the event of an oil spill to meet the requirements environmental monitoring.

BHP has a Service Level Agreement (SLA) with OSRL under which a framework agreement enables CSA Ocean Sciences to provide in-field SSDI monitoring services.

### 7.1.3 General Support

BHP has arrangements in place and access to providers to supply personnel as required to populate response teams. BHP has tested these arrangements and considers that personnel for shoreline response operations can be sourced to and maintained for the full duration of response to worst-case spill scenario. BHP will mobilise shoreline crews at the direction of WA DoT, and where possible prior to the predicted arrival of hydrocarbons. These crews will focus on pre-cleaning beach areas (e.g., removing debris such as seaweed to areas above the high tide mark) and establishing staging areas to enable a more efficient response when hydrocarbons are arriving ashore.

In consultation with WA DoT, BHP will use a staged approach to mobilise shoreline response crews with approximately 200 persons within 96 hours up to around 700[1] within 3 weeks. This level of personnel will be dependent on the location of the oil and the constraints noted below[2] and will be determined by the WA DoT.

Additional labour for a temporary contract workforce can be drawn from the significant staff resources of BHP's global petroleum operations, Iron Ore and other divisions that operate in Western Australia and more broadly across Australia. For example, BHP Iron Ore can use direct employees, contractor workforce or utilise current arrangements with Contractors to source additional personnel for shoreline response operations. It is estimated that this could source an additional 1-2,000 persons to implement shoreline response operations without affecting those mining operations.

During the first strike response phase, BHP will rely on the skilled personnel (i.e., AMOSC Core Group, OSRL) to supervise response crews. In addition, personnel from the National Response Team (NRT), Aerial Operation staff from Aerotech 1st response will be mobilised. Pending international travel restrictions due to COVID-19 pandemic, OSRL may also supply a selection of ground staff who have the practical skills and experience to assist and support BHP during a spill response and are trained in using the Incident Command System (ICS) structure.

All labour-hire or internal personnel not trained in oil spill response would receive role-specific on-the-job training prior to undertaking response operations. Training would be ongoing throughout the response operation.

BHP has standing contract with labour-hire companies to enable access to a work force that have experience and understanding of HSEQ requirements and remote / regional working. BHP's labour hire contractor (the Contractor) has estimated that they have upwards of 15,000 people on their database that currently fit the scope of work (i.e., labour intensive work relating to oil spill response). At an immediate request, the Contractor is capable of sourcing 200 people within 48 hours that have appropriate clearance checks for onsite work. The

[1] Ramp up capability of 200 persons/day from Day 3 of response

[2] Assumes shoreline crews staged out of Coral Bay, Exmouth, Onslow, Karratha

Contractor also estimate that they can source an additional 500 people and have them fully site compliant and ready to mobilise in less than 3 weeks.

### 7.1.4 Spill Response Logistics

A response to a worst-case discharge event will require a large number of equipment and personnel to be deployed and accommodated in multiple locations. Coordination of these aspects of the response will be the responsibility of the Logistics section in the IMT. BHP has a number of existing arrangements for the storage and transport of equipment in the Exmouth area, which will be initially used in a response. These arrangements include agreements with logistics providers for air, marine and land.

The current facilities in Exmouth can be supplemented by regional resources within appropriate timeframes for the response. Regional locations such as Onslow, Karratha and Port Headland are equipped to manage the logistical arrangements for construction, mining and petroleum projects, which are similar in scale to a large-scale spill response. BHP maintains a supply base in Dampier, which is immediately available to support response operations. These resources involve the movement of personnel, freight and equipment over large distances.

BHP has internal resources (Supply Team) and utilises third-party logistics providers for movements of freight from overseas locations by air or sea. The Supply team, along with the specialist contractors, are highly experienced in procurement and supply chain management for large scale projects and ongoing offshore operational activities. These skills are directly transferable to a spill response. Many of the Supply Team members are trained in the Logistics Section Chief role and are on the IMT roster.

Road transportation of personnel will be by hire cars (for team leaders, SCAT teams, small teams) and by charter buses for large movements of teams such as shoreline responders. BHP has arrangements in place with multiple service providers that are based in Exmouth that can call on additional resources regionally as well as other regional providers. Regional providers can supplement the Exmouth arrangements within 2-3 days. BHP Minerals Australia has a large Non-Process Infrastructure (NPI) team who could support BHP Petroleum with aviation, accommodation and power logistics, making charter flights, mine camps and aerodromes in the Pilbara available for the response. BHP has experience in moving large numbers of personnel over large distances during cyclone de-manning and for the construction phases of the Macedon project and Minerals Australia projects.

Freight logistics by road will utilise existing local contracts and other local operators supplemented by larger regional providers. BHP has existing arrangements in place for large scale freight movements by road in the North West and has recent experience in moving large volumes of equipment for the Macedon project as well as our multiple Western Australian Iron Ore (WAIO) operations, particularly during recent major construction projects.

Exmouth is a permanent home to 2,400 people although during tourist months the figure swells to up to 6,000. It is therefore accustomed to accommodating large influxes of people. Accommodation is likely to be a constraint in the response as the lack of suitable accommodation may restrict the numbers of response personnel that could be brought into the region. There is a variety of accommodation options in Exmouth ranging from hotel/motel, backpacker, holiday home rental and caravan and camping sites. This can be supplemented by fly-in-fly-out (FIFO) arrangements with mine camps, accommodation and aerodromes within the iron ore side of the business.

Dampier and Karratha currently have additional accommodation with large accommodation villages (i.e., Gap village) previously used for large construction projects available. These facilities can be used to accommodate responders to address shorelines in the Onslow – Dampier region if required or as a base for long commute by road or air to locations further south.

Spill modelling indicates that offshore islands may be exposed to hydrocarbons during a spill event. BHP has undertaken an assessment of the requirements that would be needed to support response operations on these islands. A Tactical Response Plan has been developed for the Muiron Islands. Other islands in the worst-case spill EMBA have similar coastal characteristics and can expect similar scale of response in terms of personnel and equipment. Small commercial vessels/utility vessels can be used to access these islands; however, the preferred method would be the use of landing craft for transport of equipment and waste. BHP has assessed that there are a number of suitable vessels that would be able to be contracted in a response that are operating regionally.

#### 7.1.4.1 Aerial Support

A contract arrangement is in place through AMSA via National Plan, to make fire attack aircraft available for dispersant spraying. The contract with Aerotech 1st Response or Dunn Aviation ensures aircraft are available within four hours of mobilisation. One of these bases is located in Jandakot, Perth, WA. Mobilisation of this service is through the AMSA Environment Protection Response Duty Officer via AusSAR. The AMOSC Duty Officer should also be notified to enable AMOSC to assist in smooth mobilisation.

AMOSC's FWADC contract provides for 'wheels up' of 6 aircraft around Australia within 4 hours of activation.

There are a significant number of additional air tractors around Australia which do not form part of the FWADC contract (40 – 50 aircraft) that can be made available within relatively short timeframes (noting timeframes vary based on time of year and current operations, e.g., fire-fighting and crop-dusting operations).

When triggered, the FWADC contract provides the following: Air Tractor AT802, pilot, Aerotech First Response Liaison Officer, an Air Attack Supervisor, an Aircraft Loading Officer, and transportation for all personnel to the nominated location.

The Air Attack Supervisor is typically identified as a key critical path role. AMOSC maintain an Air Attack Supervisor as part of the Aerotech First Response FWADC contract. Other personnel are available via AMSA and the National Response Team (traditionally from bushfire services).

An Air Attack Supervisor platform (helicopter or fixed wing) will need to be supplied by BHP, in the event BHP is the Control Agency for the spill. Aerotech First Response also have the capability to source this capability, if required. BHP would typically utilise a crew-change helicopter as the Air Attack Supervisor platform.

BHP has a contract with CHC Helicopters in Karratha to provide 2 helicopters for crew change, 24/7 Medevac, and Search and Rescue coverage. CHC's 2 helicopters can be used for aerial surveillance in event of an oil spill.

Additional aerial support could be engaged through the Global Response Network via either AMOSC or OSRL to access internationally available aircraft.

#### 7.1.4.2 Vessel Support

BHP maintains a Global Contractor Management System (GCMS) to monitor regionally available OSV.

BHP maintains oversight of availability of larger vessels that would be required to undertake a response via subscription to live vessel feeds via MarineBase. Whilst vessel availability and locations are dependent on levels of activity, data derived via vessel monitoring would inform vessel contracting during an oil spill response.

BHP have access to Clarkson's Sea/response software platform through their OSRL membership. The software uses its patented technology to identify emergency vessels and equipment most suitable for source control operations and those that are closest to the incident location. Sea/response vessel tracking has been set up to search vessels on pre-identified mission requirements covering Capping, Containment and Offset Installation Equipment (OIE). Vessels that already have an approved Safety Case for working in Australia are tracked.

Port facilities at Exmouth, Onslow and Dampier will be used throughout the response. BHP has access to a supply base in Dampier, which is immediately available to support response operations. A logistics plan will be developed by the IMT with a look ahead to replace or supplement vessels during the response operations to maintain the operational capability.

There may be circumstances where additional support vessels may be required to assist with spill response, e.g., additional dispersant spraying capability, deployment of equipment for an inshore response on North West Cape or transportation of equipment and people to offshore installations or island locations. Requests for offshore vessel support can be made by AMSA.

### 7.1.5 State and National Resources

In accordance with the State Hazard Plan – Maritime Environmental Emergency (SHP-MEE), and following consultation with the WA DoT, additional personnel to assist with labour intensive aspects of a response (if required) will be sourced through the State Combat Committee (Executive Advisory Group). Depending on the level of response required, sources of labour may include the local shire, DBCA and AMSA.

Under the National Plan, a National Response Team (NRT), comprising experienced personnel from operator to senior spill response manager level from Commonwealth/State/NT agencies, industry and other organisations, has been developed.

The services of the NRT will be obtained through the Environment Protection Group (EPG) and AMSA, which has made arrangements with the respective government and industry agencies, for the release of designated personnel for oil spill response activities. These services will be activated when it is assessed that an oil spill incident exceeds the resource availability at the state level.

During a National Plan incident, the BHP Perth IMT or the Marine Pollution Controller appointed by a Control Agency may submit a request to AMSA for personnel from other States/NT to become part of the Incident Management Team or the incident response team.

A request should be made initially through the Environment Protection Duty Officer via the Emergency Response Centre on 1800 641 792 or 02 6230 6811. This request must be followed by written confirmation within three (3) hours of the verbal request.

The following information will be provided when making such a request:

- Roles or skills required (e.g., Planning Officer, Aerial Observer);
- Number of personnel required to fill each role;
- Contact name, address, and time of where personnel are to initially report; and
- Brief overview of the work to be undertaken.

Suitable personnel will then be selected by AMSA from the National Response Team or the National Response Support Team (NRST) unless special circumstances exist.

### 7.1.6 Exmouth Working Group

BHP, in conjunction with Santos and Woodside, has established an Exmouth Working Group to mutually assist in oil spill preparedness and response in the Exmouth region. Industry mutual aid equipment is detailed within Appendix A – Industry Response Equipment.

## 7.2 Field Capability for Selected Response Strategies

This section provides a detailed field capability assessment (consistent with the principles of IPIECA-IOGP (2013 and 2016c)) for each of the response strategies selected via the SIMA process, including:

- A summary of each response strategy including basis of assessment considerations (where relevant) and response tier level (refer Section 6);
- An overview of potential environmental impacts and risks relevant for each response strategy (with further detail provided in Section 8);
- Presents an evaluation of relevant oil spill budget considerations for the response strategy;
- Response arrangements in place to meet response capability requirements presented in Section 6.4 and associated operational considerations;
- A description of response timing for the implementation of each strategy (including relevant assumptions);
- A summary of legislative and other considerations relevant to the response strategy;
- A detailed ALARP evaluation as per the process described within Section 6.2.2 of the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and ALARP supporting information (if additional context required);
- Response preparedness performance standards to maintain sufficient field capability for the timely implementation of the response strategy;
- A demonstration of acceptability of preparedness arrangements for each response strategy; and.
- The environmental performance requirements to maintain field capability readiness for each of the selected response strategies presented in the form of Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria.

The EPOs and EPSs related to the IMT capability/arrangements are contained in the *APU IMT Capability Assessment Report* (AOHSE-ER-0071).

The EPOs and EPSs relating to the management of potential environmental impacts and risks associated with the implementation of response strategies are presented within the *Pyrenees Phase 4 Infill Drilling Oil Pollution Emergency Plan* (OPEP) (BHPB-04PY-N950-0022).

Consultation was conducted with the Western Australian Department of Transport (WA DoT) as Controlling Agency in State Jurisdiction and the Wildlife Response Agency (WA Department of Biodiversity, Conservation and Attractions (DBCA)) to inform the capability requirements and response timeframes for shoreline and nearshore response strategies, namely: shoreline clean-up & assessment technique (SCAT), shoreline protection & deflection, shoreline clean-up, and oiled wildlife response (OWR).

### 7.2.1 Source Control Response Time Model (RTM)

A detailed Response Time Model (RTM) was specifically developed using industry standard RTM modelling outlined in IOGP 592: Subsea Capping Response Time Model Toolkit User Guide.

Timings are calculated using available information at the time of development.

A future start date of June 1st, 2022 was assumed. The RTM was calculated using the following assumptions:

- OSRL Singapore Capping Stack as Primary Source Control device;
- Mobilisation by sea direct to well site;
- OSRL Stavanger Air Freight able Capping Stack as secondary device;
- As the primary plan is to mobilise the CSS direct to the Pyrenees Field;
- No significant delays due to weather;
- No significant delays due to approvals; and
- No significant delays due to customs & immigration (including Covid-19 restrictions).

As summary of the RTM for source control strategies is presented in Figure 7-1 below:

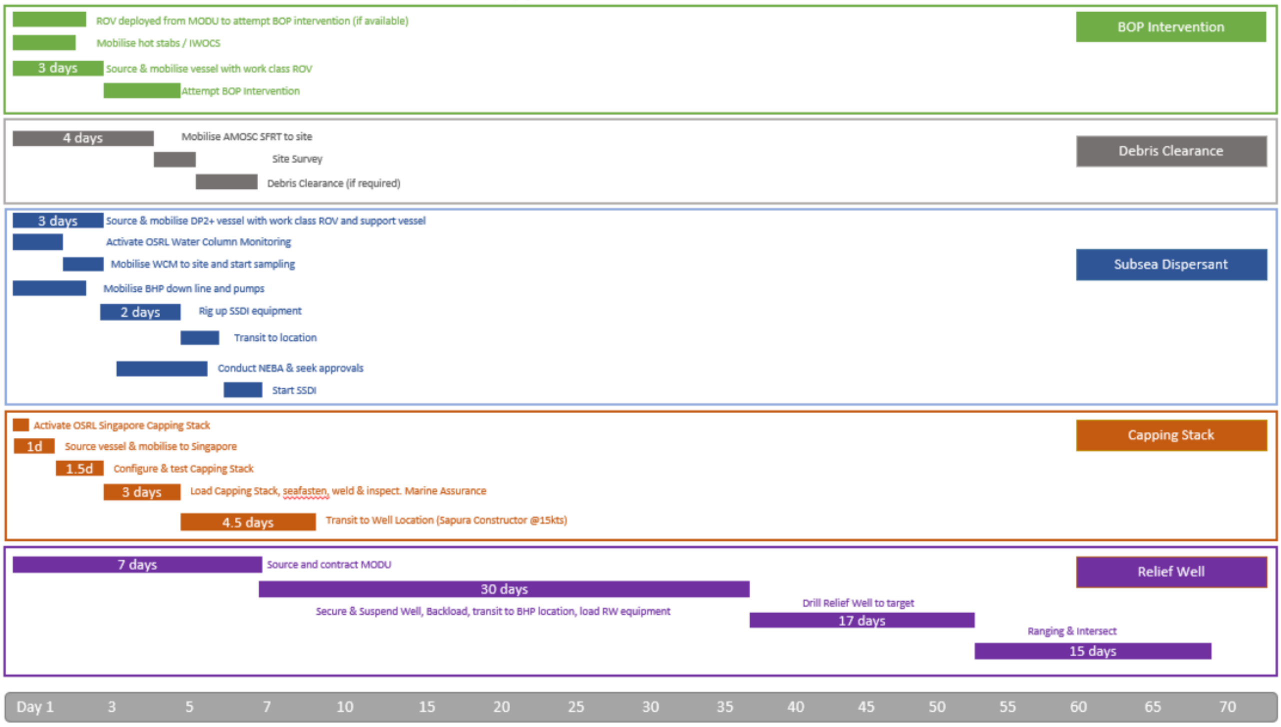



**Figure 7-1: Response time model (RTM) summary for source control**

### 7.2.2 Source Control – Vessel-based (RS1-1)

**Summary of Activity – Vessel-based control (Tier 1 -2)**

The basis of assessment for vessel-based source control relates to the potential surface release of MDO from fuel tank rupture on an offshore vessel as per Table 3-1. The assessment assumes a fixed volume of hydrocarbon release within an offshore environment.

Vessel-based source control methods are implemented as the primary response strategy for responding to single point releases from transfer operations, hull leakage and spills in the event of a vessel collision. Source control will be activated immediately by persons onboard, under the direction of the Vessel Master, to reduce or control the discharge and conducted according to the vessel-specific MARPOL-compliant SOPEP for vessels, as required under *International Convention for Protection of the Sea (Prevention of Pollution from Ships) Act 1983*; AMSA Marine Orders – Part 91 and Part 94; and MARPOL Annexes I and III. Vessel-based source control activities will always include consideration of human health and safety applying the principles of Safety of Life at Sea (SOLAS).

Vessel-based source control activities will be dependent on the type of incident but may include:

- Closing valves, isolating pipework and shutting down pumps.
- The use of temporary patches or bungs/ plugs to seal holes to prevent further releases, until more permanent measures can be made.
- The transfer of product between tanks on the vessel or between vessels - in the event of a leaking tank or tank rupture from a vessel collision.
- The use of spill response equipment located around the vessel, including small booms, absorbent pads, spill absorbent litter, spill recovery containers, permissible cleaning agents and other materials available onboard to clean-up spilled material on deck. Remaining oily spill residues on decks or other surfaces may be washed into drains leading to the oil-water separator system to treat the effluent prior to discharge.

**Potential Environmental Impact and Risks – Source Control (Vessel-based)**

There are no additional environmental impacts and risks associated with a vessel-based source control response in offshore waters to those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for 'Offshore Response Operations'.

**Response Arrangements – Source Control (Vessel-based)**

AMSA is the Controlling Agency for vessel-related incidents within Commonwealth waters. Under the National Plan AMSA may call upon a National Response Team or the National Response Support Team (NRST) and national stockpile resources.

**Response Timing – Source Control (Vessel-based)**

Controls implemented aboard the stricken vessel under the direction of the Vessel Master are assumed to be implemented immediately upon identification of a spill scenario.

When a stricken vessel requires support from a third-party, (under the direction of AMSA) the response may take a number of days to implement.

**Legislative and Other Considerations – Source Control (Vessel-based)**

MARPOL-compliant SOPEP / SMPEP (suitable to class) for vessels, as required under *International Convention for Protection of the Sea (Prevention of Pollution from Ships) Act 1983.*

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

**ALARP Evaluation – Source Control (Vessel-based)**

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H): Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from the execution of this response strategy. | No source control from vessel. | Do nothing option. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option. Halting the release of MDO or chemicals is essential. | The do-nothing option is not considered acceptable. | **Reject:** Source control is a recognised strategy for the mitigation of oil spill impacts. |
| **Substitute** | Leaking vessel inoperable / unable to implement source control | Source control from alternate vessel within region | Administered by AMSA | As per NatPlan | - | 1-2 days (assumed) | Minor | H | H | H | H | H | Limit release volume | Availability of response vessel<br>Location of stricken vessel<br>Weather and sea state | **Accept:** Control to form component of response strategy |
| **Engineer** | Spill control equipment unavailable | Spill control equipment available aboard AHTS vessels as per SOPEP / SMPEP | Control is based on MARPOL Annex I (Prevention of Pollution by Oil). | As per SOPEP / SMPEP | - | Immediate | N/A | H | H | H | H | H | Limit release volume | Location of stricken vessel<br>Weather and sea state | **Accept:** Control to form component of response strategy |
| **Separate** | Source of spill remains active | Isolate source of spill (tank / hose) as per SOPEP / SMPEP | Control is based on MARPOL Annex I (Prevention of Pollution by Oil). | As per SOPEP / SMPEP | - | Immediate | N/A | M | H | H | H | H | Limit release volume | Location of stricken vessel<br>Weather and sea state | **Accept:** Control to form component of response strategy |
| **Administrate** | No MARPOL-compliant SOPEP or SMPEP. | Vessel-specific MARPOL-compliant SOPEP or SMPEP. | Control is based on MARPOL Annex I (Prevention of Pollution by Oil). | As per SOPEP / SMPEP | - | Immediate | N/A | H | H | H | H | H | Implements response plan to deal with unplanned hydrocarbon spills quickly and efficiently in order to reduce impacts to the marine environment. | Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for the operation. | **Accept**: Controls based on legislative requirements must be accepted. Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained. |

### 7.2.3 Source Control – Subsea Intervention (RS1-2)

**Summary of Activity – Subsea Intervention (Tier 1 – Tier 2)**

The basis of assessment for subsea intervention source control relates to the potential subsea release of crude oil from a loss of containment from the Stickle-4H1 well or a release of crude oil from Crosby or Stickle subsea flowline due to rupture from dropped object or anchor drag as per Table 3-1.

Subsea intervention methods are implemented for a subsea release. Source control via subsea intervention is a primary response strategy for responding to subsea LOWC due to failure of well barrier integrity (Level 3 spill); and responding to a loss of inventory of a flowline (Level 2 spill).

When possible, subsea intervention will be activated immediately by the MODU Offshore Installation Manager (OIM) and where relevant the Vessel Master or FPSO Control Room. Source control actions will always include consideration of human health and safety.

Subsea intervention activities will be dependent on the nature of the release but may include:

- Dropped object or anchor drag severing flowline:
  - Initiate emergency shut-down from FPSO;
- Loss of containment during activity with MODU operable:
  - Initiate emergency shut-down from MODU to shut in BOP;
  - The activation of the BOP and subsea tree (SST) controls via manual ROV override;
  - Closure of the Surface Controlled Subsurface Safety Valve (SCSSV) via MODU (well status dependent);
  - Well kill from MODU (by bullheading production bore);
- Loss of containment during activity with MODU inoperable:
  - Well kill procedures from FPSO (by bullheading production bore)

    This is achieved by pumping well kill fluid with the well kill pump aboard the FPSO via the gas-lift system (following the opening of mechanical barriers on the manifold via ROV) to displace existing well fluids into the formation with well kill fluid. This is considered a secondary well kill option given it is not feasible to implement during an open-hole LOWC scenario.
- Loss of containment managed by vessel with MODU inoperable:
  - The activation of the BOP and SST controls via manual ROV override from AHTS vessel with Work Class ROV capability.
  - Alternate ROV support vessel to activate BOP and SST controls as above.

In the event of a LOWC scenario, RS1.2 is to be implemented concurrently with RS1.3, RS1.4, and RS1.5 (see below).

**Potential Environmental Impact and Risks – Subsea Intervention**

There are no additional environmental impacts and risks associated with a subsea intervention response in offshore waters to those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for ‘Offshore Response Operations’.

### Response Arrangements – Subsea Intervention

The Pyrenees Venture FPSO vessel is moored in-field and has emergency shut-down capability for all flowlines within the field.

The MODU has a subsurface blowout preventer (BOP), enabling attachment to the wellhead and providing primary well control barrier during drilling activities. In accordance with BHP standards, and consistent with APIS53, the BOP is required to contain at least one annular sealing element and one blind-shear ram capable of shearing and then sealing the wellbore; and contain at least four rams, one of which shall have shear capability.

The MODU is equipped with a 'Work-Class' remotely operated vehicle (ROV). Additionally, Offshore Support Vessels (OSVs) with 'Work-Class' ROVs are readily available on the open market and available within the Exmouth / Dampier region.

BOP intervention equipment is available within the AMOSC SFRT and OSRL SIRT, subsea accumulator kit, spreader bar and mud skirts, BOP intervention skid, dual BOP interface manifold, deployment rack for flying leads, and a 250 m flying lead as detailed within the BHP Australia Source Control Emergency Response Plan (SCERP) (OSRL-SW-PLA-00025).

### Response Timing – Subsea Intervention

Emergency shut-down from the FPSO can be initiated immediately (<1 hour) from the control room following detection of a flowline rupture.

BOP activation can be initiated immediately (<1 hour) from the MODU assuming the MODU is operable. Manual override via ROV aboard the MODU is dependent on deployment timeframes but would likely be implemented in <1 hour.

Should an alternate OSV with ROV capability be deployed, steam time to field and ROV deployment may take 6-12 hours.

Bullheading production bore with MODU operable would likely take 6 hours.

BOP intervention via SFRT is anticipated to take 5 days including equipment mobilisation to site.

### Legislative and Other Considerations – Subsea Intervention

There are no additional legislative requirements or alternate considerations to implement subsea intervention, as this response is considered within existing in-force approvals.

| Controls | | | | ALARP Evaluation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from not adopting source control. | No source control via subsea intervention. | Do nothing option. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option. Halting the release of hydrocarbons is essential. | The do-nothing option is not considered acceptable. | **Reject:** Source control is a recognised strategy for the mitigation of oil spill impacts. |
| **Substitute** | Subsea intervention ineffective to control loss of containment | Concurrent implementation of capping stack deployment and relief well | Creates redundancy in response options and provides greater degree of well containment assurance | Multiple | - | Strategy dependent | High | H | H | H | H | H | High cost, however potential benefit of building redundancy into response strategies has potential expedite control of well and subsequently reduce environmental harm. | Practicable to implement concurrent response strategies. IMT Source Control Section structure enables concurrent response activities. | **Accept:** Source control strategies can be implemented concurrently to increase likelihood of successful well kill. |
| **Engineer** | Engineering controls inadequate to contain release | Initiate emergency shut-down from FPSO | Rapid source control with minimal intervention | FPSO Control Room | 1 | <1-hr | Low | H | H | H | H | H | Maximum volume of flowline. | Immediate implementation from FPSO. Non-feasible for LOWC scenario. | **Accept:** only for flowline release. Not feasible for LOWC scenario. |
| | | BOP – activated from MODU | BOP actuation is a primary control | MODU emergency shut-down BOP | 1 | <1-hr | Low | H | H | H | H | H | Significant environmental benefit gained by rapid closure of BOP limiting release rate / volume of hydrocarbons. | BOP MODU operable. System tested. Training. BOP monitoring in place. BOP redundancy / deadman. Emergency shut-down sequencing. | **Accept:** BOP actuation is a primary control. |
| | BOP unable to be activated via MODU | BOP and subsea tree (SST) controls - activated via manual ROV override | BOP actuation is a primary control – ROV aboard MODU has specific interface with MODU BOP. | ROV aboard MODU | 1-2 | <1-hr | Low | H | H | H | H | H | Significant environmental benefit gained by rapid closure of BOP limiting release rate / volume of hydrocarbons. | ROV (high output) pump designed to close BOP rams within specific timeframes according to API specifications. Response potentially limited by sea state up to 3-4 m. | **Accept:** BOP actuation is a primary control supported by ROV if required. |
| | | MODU IWOCS (intervention workover control system) | Closure of the Surface Controlled Subsurface Safety Valve (SCSSV) via MODU | MODU IWOCS (intervention workover control system) | 1 | <1-hr | Low | H | H | H | H | H | Significant environmental benefit gained by rapid closure of SCSSV limiting release rate / volume of hydrocarbons. | Upper completion must be in place. Dependant of MODU operability. 2-yr test on SCSSV. | **Accept:** IWOCS standard control aboard MODU. |
| | | Well kill from MODU (by bullheading production bore) | Well kill | Operable MODU | 1 | <6 hrs | Low | H | H | H | L | H | Significant benefit by implementing well kill. | Scenario driven. If low volume release this response may be valid. If full LOWC, emergency shut-down initiated and MODU evacuated. | **Accept:** Primary response strategy – scenario dependent. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MODU (and MODU ROV) inoperable | Well kill procedures from FPSO (by bullheading production bore) | This is achieved by pumping well kill fluid with the well kill pump aboard the FPSO via the gas-lift system to displace existing well fluids into the formation with well kill fluid. | In-field vessel with ROV capability | 1 | 3 hrs (ROV available)<br><br>6-12 hrs from FPSO for well kill | Moderate | H | H | L | H | H | Significant environmental benefit gained by rapid control of release rate / volume of hydrocarbons. | Feasible with in-field vessel with ROV capability. This is considered a secondary well kill option given it is not feasible to implement during an open-hole LOWC scenario. During a less-than-worst-case scenario, this strategy could be implemented simultaneously with relief well operations. | **Accept:** Secondary response strategy during lower-flow LOWC event. Not feasible for full-flow LOWC. |
| | | The activation of the BOP and SST controls via manual ROV override from AHTS vessel with Work Class ROV capability. | AHTS vessels in field with ability to initiate rapid response | In-field vessel with ROV capability | 1 | 3 hrs (ROV available) | | H | H | H | H | H | Significant environmental benefit gained by rapid closure of BOP limiting release rate / volume of hydrocarbons | Feasible with in-field vessel with ROV capability. | **Accept:** Control to form component of response strategy. |
| | In-field AHTS vessel incapable to implement source control | Alternate ROV support vessel to activate BOP and SST controls as above | Contract rather than specific vessels | Alternate third-party vessel with ROV capability | 1 | 6-12 hours | | H | H | H | H | H | Significant environmental benefit gained by closure of BOP limiting release rate / volume of hydrocarbons. | Feasible with regionally available vessels with ROV capability. | **Accept:** Control to form component of response strategy. |
| **Separate** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **Administrate** | No source control contingency pre-planning increasing overall time and risk associated with well kill operations | BHP Australia Source Control Plan Emergency Response Plan (SCERP) | Consistent with industry good practice, BHP corporate requirements, IOGP Report 594 and APPEA Guidelines for source control | Multiple concurrent response strategies included | N/A | Immediate (upon initiation of BHP IMT Source Control Section) | Low | N/A | N/A | N/A | N/A | N/A | N/A | N/A | **Accept:** Control to form component of response strategy. |
| | | Monitor response vessel availability | Monitor available vessels with technical capability to initiate well control via ROV | N/A | N/A | Ongoing | Low | H | H | H | H | H | Benefit gained by rapid identification of alternate vessel(s) to implement response. | Feasible with multiple OSV available. | **Accept:** Control to form component of response strategy |
| | Equipment unavailable to undertake subsea intervention activities | BHP signatory to APPEA MoU: Mutual Assistance | Enables access to regional industry equipment & personnel | MoU in place | 1 | Immediate (upon initiation of BHP IMT Source Control Section) | Low | H | H | H | H | H | Enabling subsea intervention provides net benefit. | APPEA MoU in place. | **Accept:** Control to form component of response strategy. |

### 7.2.4 Source Control – Relief Well (RS1-3)

**Summary of Activity – Relief Well (Tier 3)**

The basis of assessment for relief well drilling source control relates to the potential subsea release of crude oil from a worst-case loss of containment from the Stickle-4H1 well as per Table 3-1.

The primary response document for the implementation of well kill operations via a relief well in the event of a LOWC is the *BHP Source Control Emergency Response Plan (SCERP)*. The particulars of the relief well location, design and dynamic kill plan will be detailed in the SCERP.

The relief well response strategy will be implemented for Level 3 spills only. A relief well is the initial and highest priority response strategy for responding a loss of well control (LOWC) and is a necessity to intercept the uncontrolled hydrocarbon zones from the well and to stop or limit further pollution, in this case, crude oil, into the marine environment. The relief well is designed to be drilled via a MODU at a location at a safe distance from the flowing well.

A conservative approach has been adopted for the assessment of a LOWC by modelling the worst-case release scenario of 156,774 $m^3$ crude oil over 69 days.

Source Control – Relief Well activities include:

- Establishment of the Source Control Section (SCS): Relief Well Group embedded within the BHP IMT;
- Implementation of the *BHP Source Control Emergency Response Plan (SCERP)* inclusive of a Relief Well Plan;
- Activation of the APPEA Memorandum of Understanding: Mutual Aid to source and mobilise a MODU and AHTS vessels within the region or source a suitable MODU from international waters (if required); and
- Mobilisation of resources (including BHP, third-party responder and Contractor Drilling personnel) to oversee relief well drilling operations.

The complexity of the Stickle-4H1 well has been evaluated according to the criteria detailed within the APPEA - Australian Offshore Titleholders Source Control Guideline and has been evaluated as having a 'medium' to 'low' level of complexity, with modelling indicating only a single relief well would be required to kill the well.

**Potential Environmental Impact and Risks – Relief Well**

There are no additional environmental impacts and risks associated with a vessel-based response in offshore waters to those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for 'Offshore Response Operations'.

**Response Arrangements – Relief Well**

**Procedure**

*BHP Australia Source Control Emergency Response Plan* (SCERP) (OSRL-SW-PLA-00025)

Execution plans for a relief well will be similar to a standard well. A relief well is typically drilled as a vertical hole down to a planned deviation ("kick-off") point, where it is turned toward the target well using directional drilling technology and tools. Dynamic kill well control commences after the target well is intersected, by pumping drilling fluid down the relief well into the incident well to kill the flow. Cement may follow to seal the original well bore.

Casing and wellhead inventories will be maintained to ensure there is always equipment readily available to drill a relief well.

BHP has Master Service Agreements in place for specialist assistance to help with engineering and operational support for relief well planning and execution.

**MODU Specifications**

An alternate moored semi-submersible MODU must be capable of operating within 200 m water depth, have a BOP meeting or exceeding APIS53 requirements and have a minimum of eight-point mooring system (minimum twelve-point if operating over NWS cyclone season).

**MODU Availability / Tracking**

In the event that the primary MODU undertaking the activity is non-operable, BHP would seek an alternate MODU located regionally in the first instance. The MODU would be sourced under the arrangements of the APPEA Memorandum of Understanding: Mutual Aid agreement. Over the period of the proposed drilling activity, BHP anticipate there would be multiple alternate MODUs located within Australian waters capable of undertaking relief well drilling operations in the Pyrenees field. The status of these MODUs along with AHTS vessels is monitored by BHP on a monthly basis during the activity.

In the event that a suitable MODU is unavailable within the region at the time of the activity, an alternate MODU would be sought from South East Asia to undertake the relief well drilling operation. BHP actively monitors current MODU market availability through an independent market analyst and MODU broker service.

**Response Timing – Relief Well**

The APPEA Memorandum of Understanding: Mutual Aid allows for 'best endeavours' for a MODU to be made available. It is anticipated a regionally available MODU could be secured and mobilised to site within 2 weeks.

Sourcing an alternate MODU from international waters represents a worst-case scenario and has been used to inform the WCD oil spill trajectory modelling and the overall preparedness needs analysis for BHP to gain control of the well.

It is estimated that it could take up to 49 days to drill and dynamically kill the incident well, assuming a MODU in the North-West Shelf (NWS). For a MODU mobilised outside the NWS, this could add an additional 20 days, depending on location and environmental conditions. The general tasks and approximate timings to engage and mobilise a MODU to field are:

- Suspend operations and secure well (under APPEA MoU) and/or source and contract MODU (approx. 7 days)
- Mobilise MODU to location from within region (approx. 7 days) or mobilise MODU to location from S.E. Asia (approx. 30 days)
- Drill well to casing shoe (approx. 17 days)
- Intercept and kill well (approx. 15 days)

**Legislative and Other Considerations – Relief Well**

The MODU and AHTS vessels contracted to undertaken relief well drilling operations will require an Australian Safety Case (accepted by NOPSEMA) and Safety Case Revision.

In the event that an alternate MODU / AHTS vessels are required, pending technical capability review, BHP shall prioritise engaging a locally / regionally available MODU and vessels with existing Safety Case with best endeavours arrangements under the APPEA Memorandum of Understanding: Mutual Aid. The in-force BHP Safety Case Revision would be leveraged to expedite the development of a MODU-specific Safety Case Revision for the relief well drilling operation. In this scenario, BHP consider a Scope of Validation is suitable to undertake relief well drilling operations.

Should a MODU be required from an international location, in addition to availability and technical capability review, priority shall be given to a MODU that has previously operated in Australian Jurisdiction where a historical Safety Case (and Scope of Validation) may form the basis of a regulatory submission to NOPSEMA.

Where a MODU is engaged that has neither a current / historical Safety Case and scope of validation, these documents shall be developed in consultation with both the MODU Operator and NOPSEMA immediately following contractual engagement and simultaneously with mobilisation to field.

Whilst the revision and acceptance timeframes for Safety Cases / Safety Case Revisions / Scope of Validations is subject to a number of variables, BHP shall engage suitably qualified HSE professionals with relevant petroleum industry experience to facilitate and assist in approval development, revision and submission on a 24 hour / 7 days a week basis following MODU engagement until all required approvals are in-force.

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Implementation Time | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from not adopting source control. | No source control. | Do nothing option. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option. Halting the release of hydrocarbons and spill clean-up activities are essential. | The do-nothing option is not considered acceptable. | **Reject:** Source control is a recognised strategy for the mitigation of oil spill impacts. |
| **Substitute** | Failure to intersect wellbore to affect well kill in a timely manner | Concurrent implementation of: Subsea Intervention; Capping Stack; & Well Containment | Concurrent implementation of alternate source control strategies with relief well as primary. | N/A | N/A | 16 – 69 days to kill well | High | H | H | H | H | H | Provides back-up for well securement | Field SIMOPS | **Accept:** Source control strategies can be implemented concurrently to increase likelihood of successful well kill. |
| **Engineer** | No MODU available to implement well kill via relief well | Alternate MODU on standby within field to immediately implement relief well. | Expedite commencement of relief well drilling | N/A | MODU | ~35 days to kill well | High $1.4M+ / d (2x MODUs) ~$84M additional cost<br><br>+ $20-30M to mob from outer region | M | H | H | H | H | Well kill potentially 2 weeks sooner that seeking alternate MODU via APPEA MoU. | The availability of multiple MODUs within region not assured. Prohibitively expensive to engage multiple MODUs for single well campaign. Likely contracting & scheduling restrictions. | **Reject:** Cost of strategy grossly disproportionate given alternate MODUs readily available for mobilisation. |
| | | Alternate & technically capable MODU engaged via APPEA MoU | Initiate relief well drilling in a timely manner with technically capable & regionally available MODU (inclusive of Aust. Safety Case) | Multiple | MODU | ~49 days to kill well | High $700k+ / d | H | H | H | H | H | Well kill potentially 3 weeks sooner than seeking alternate MODU from South East Asia via open market. | Current as of 2021 – up to 4 alternate MODUs and associated support vessels suitable for relief well drilling identified within regional waters. All with existing Australian. Safety Case. Potential constraint should technical capacity of MODU not meet requirements. | **Accept:** Primary strategy to engage MODU via APPEA MoU. Benefit outweighs cost. |
| | Alternate & technically capable MODU unavailable via APPEA MoU | Alternate MODU sourced from South East Asia (Singapore) with increased technical capability | Initiate relief well drilling in a timely manner with available MODU (Safety Case required) | Multiple | MODU | ~69 days to kill well | High $700k+ / d<br><br>+ $20-30m to mob from outer region | H | H | H | H | H | Overall potential benefit in controlling well release. Extended period to implement well kill when compared with in-region MODU. | MODUs readily available from South East Asia on open market. Potentially time constrained by procurement, quarantine readiness, mobilisation, COVID readiness & lack of Australian Safety Case. | **Accept:** Secondary strategy to engage MODU via open market. Benefit outweighs cost. |
| | Required hardware and consumables not available in a timely manner to implement relief well drilling | Maintain casing and wellhead inventories to implement relief well as per design | Equipment availability | As per well design | N/A | N/A | Moderate | H | H | H | H | H | Ready access to equipment | No identified constraints. | **Accept:** Benefit outweighs cost. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | Pre-drill top hole of relief well | Potential reduction in overall time to drill relief well. | | | 14 days to drill<br><br>Approx. time saved compared with relief well = 4 days | High $25-30M+<br><br>X2 wells<br><br>= $50-$60m | L | H | H | H | H | ~4 days (possible) of hydrocarbon release | Pre-drill 2x top holes (2 relief well locations) Time required to mobilise MODU to pre-drilled relief well. Multiple mooring operations increased risk (dropped objects on existing infrastructure) | **Reject:** limited benefit gained given mobilisation of MODU required to intercept well bore. Cost grossly disproportionate to limited benefit gained. |
| **Separate** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **Administrative** | Delay in sourcing required hardware & consumables | Confirm open-market availability of required hardware and consumables to implement relief well as per design | Validate readiness to respond to LOWC prior to activity. | Hardware & consumables | | Pre-drill | Low | H | H | H | H | H | Potential increased timeliness and effectiveness of source control response by validating control readiness. | No identified constraints. | **Accept:** Control to form component of response strategy. |
| | | BHP Australia Source Control Plan Emergency Response Plan (SCERP) including Relief Well Plan | Consistent with industry good practice, BHP corporate requirements, IOGP Report 594 and APPEA Guidelines for source control | Multiple concurrent response strategies included | 1 | Immediate | Moderate | H | H | H | H | H | Potential increased timeliness and effectiveness of source control response through pre-planning. | No identified constraints. | **Accept:** Control to form component of response strategy. |
| | Alternate MODU unavailable to undertake relief well activities | APPEA MoU: Mutual Assistance | Enables best endeavours access to suitable MODUs and support vessels to implement relief well drilling. | Multiple | 1 | Immediate | Low | H | H | H | H | H | Potential increased timeliness and effectiveness of source control response through pre-planning. | MODU availability and readiness. MoU best endeavours only with no binding commitment / obligation. | **Accept:** Control to form component of response strategy. |
| | | Ongoing tracking for suitable alternate MODUs on a regular basis prior to and during drilling activity | Ongoing validation of technically capable & available MODUs | Multiple | 1 | Pre-drill | Low | H | H | H | H | H | Potential increased timeliness and effectiveness of source control response by validating control readiness. | No identified constraints. | **Accept:** Control to form component of response strategy. |
| | Non-competent personnel increasing risk of unsuccessful well kill. | Well Control Training | Supervisory-level certificate from a well control accredited program (IWCF or IADC WellSharp). | Multiple personnel | | Immediate – upon formation of IMT SCS | Low | H | H | H | H | H | Potential increased timeliness and effectiveness of source control response by trained personnel | No identified constraints. | **Accept:** Control to form component of response strategy. |
| | | Remote working - Technical support | SCS functions can be fulfilled remotely to increase local / regional capacity. | Multiple personnel | | Immediate – upon formation of IMT SCS | Low | H | H | H | H | H | Potential increased timeliness and effectiveness of source control response by trained personnel | No identified constraints. | **Accept:** Control to form component of response strategy. |
| | Alternate MODU unauthorised to undertake petroleum | MODU tracking includes: | Validation of MODU preparedness | MODU(s) of opportunity validation | 1 | 30 days prior to spud | Low | H | H | H | H | H | Potential increased timeliness in pre-identifying alternate | No identified constraints. | **Accept:** Control to form component of response strategy. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H): Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | activities within Australian Cth Waters. | • MODU availability<br>• MODU safety case status & scope | | | | | | | | | | | MODU ready to undertake response. | | |
| | No Safety Case in place for alternate MODU | Only seek alternate MODU with pre-existing NOPSEMA-accepted Safety Case in place | No delay in obtaining Aust Safety Case. | N/A | N/A | - | - | H | H | H | H | H | Safe management systems pre-validated leading to earlier implementation of response. | Alternate MODU without Aust Safety Case may have increased technical capability and be more suited to task. | **Reject:** Primary strategy involves alternate MODU with Aust. Safety Case, but alternate would not be excluded if available and technically capable. |
| | | Support the development of Safety Case for potential international MODU | If Safety Case required | N/A | N/A | Prior to spud | Low - Admin | H | H | H | H | H | Safe operations essential | Support development concurrently with MODU mobilisation. Time to develop and have accepted. | **Accept:** Only if required. Secondary strategy if no alternate MODU available. |
| | BHP IMT / SCS / third-party responders unfamiliar with relief well planning and increasing overall time and risk associated with relief well implementation | Emergency exercise testing arrangements in place for relief well operations | Readiness review | All | - | Pre-drill | Low - Admin | H | H | H | H | H | Potential increased timeliness and effectiveness of source control response by validating control readiness. | Desktop validation only. No deployment of alternate MODU, equipment or consumables. | **Accept:** Control to form component of response strategy. |

### 7.2.5 Source Control – Capping Stack (RS1-4)

**Summary of Activity – Capping Stack (Tier 3)**

The basis of assessment for capping stack source control relates to the potential subsea release of crude oil from a loss of containment from the Stickle-4H1 well as per Table 3-1.

The capping stack response strategy may be implemented for Level 3 spills only, and where conditions allow. The deployment of a capping stack system (CSS) is considered a primary response strategy for responding a LOWC and will only be applied given favourable environmental conditions including the open-hole flow rate from the well, the safe work zone surrounding the well site and prevailing weather conditions during the LOCW event.

Pending suitable conditions, a capping stack may be installed either vertically or via Offset Installation Equipment (OIE).

Source Control – Capping Stack activities include:

- Establishment of the Source Control Section (SCS): Well Capping Group embedded within the BHP IMT;
- Implementation of the *BHP Source Control Emergency Response Plan (SCERP)* inclusive of a Capping Stack Mobilisation Plan;
- Activation of the contract with OSRL to prepare and transport the capping stack system from Singapore direct to the Pyrenees field; and
- Mobilisation of resources (including BHP and third-party responder personnel) to oversee capping stack installation.

**Potential Environmental Impact and Risks – Capping Stack**

There are no additional environmental impacts and risks associated with a vessel-based response in offshore waters to those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for 'Offshore Response Operations'.

The environmental impact and risk evaluation for the use of subsea dispersants is provided in Appendix B – Dispersant Application Risk Assessment.

**Response Arrangements – Capping Stack**

**Procedure**

*BHP Australia Source Control Emergency Response Plan* (SCERP) (OSRL-SW-PLA-00025)

**Personnel**

Specialist well control personnel supporting the BHP IMT SCS are detailed within the APU IMT Capability Analysis (Appendix B of the OPEP).

Specialist capping stack deployment personnel travel direct to site from Singapore with the CSS and are engaged via OSRL Service Agreement.

**Equipment**

**Capping Stack System (CSS)**

The subscription to the OSRL SWIS Supplementary Agreements provides BHP with access to OSRL Capping Stacks.

There are four Capping Stack Systems (CSS) with the approval to mobilise up to two of the available capping stacks in the event of an incident. The CSS are stored fully assembled and maintained in a response ready state for mobilisation and onward transportation by sea and/or air in the event of a source control incident.

The CSS are stored at bases strategically located around the globe (15k in Brazil / Norway and 10k in South Africa / Singapore) and all bases have direct deep draft quayside access.

If required, Offset Installation Equipment (OIE) is available for mobilisation via OSRL from Trieste, Italy.

**Vessel Sourcing**

BHP have access to Clarkson's Sea/response software platform through their OSRL membership. The software uses its patented technology to identify emergency vessels and equipment most suitable for source control operations and those that are closest to the incident location. Sea/response vessel tracking has been set up to search vessels on pre-identified mission requirements covering Capping, Containment and Offset Installation Equipment (OIE). Vessels that already have an approved Safety Case for working in Australia are tracked.

In the event of an offshore emergency, Sea/response live vessel availability tracking will enhance operational preparedness whilst aiming to reduce environmental damage and meet the needs of regulators.

**Vessel Transport Configuration / Minimum Vessel Specification**

This includes 2x Chokes, Spreader Bar, Test Stand and H4 connector. The total weight is approximately 90 metric tonnes.

Minimum specifications for the deployment vessel are:

- DP2 capability
- Min (2) Medium Work Class ROVs with capability to reach mud line at incident well centre and survey 50 m radius around well centre with carrying capacity:100 kg
- Active heave compensated crane with minimum 130t mud line capacity
- Minimum 400 $m^2$ deck space
- Accommodation for 25+ personnel

**Response Timing – Capping Stack**

BHP has identified deployment vessel availability as the main limiting factor for the timeliness of capping stack mobilisation and deployment. As such, in September 2021, BHP commissioned a study with Clarkson's using Sea/response to look at the vessel market around the Australia and Pacific region to search for available vessels capable of transporting and deploying the OSRL Singapore Capping Stack. The search was limited to a series of minimum requirements for the capacity and capability of deployment vessels. The results indicated that as of September 2021, there were 16 vessels within 2,000nm of Singapore capable of deploying a capping stack. The search was further narrowed to those vessels ready to respond and with Australian Safety Cases, with 3 of the 16 meeting all criteria.

Assuming a suitable vessel is available during an emergency condition, response time modelling indicates that a capping stack could be mobilised directly from Singapore to the Pyrenees Field within 10 days. Once on location, it is assumed the CSS could be deployed within 2 days. This 12-day mobilisation and deployment timeframe represents an optimal 'best-case' scenario assuming there are no delays due to logistical constraints or adverse weather / sea state. Whilst best endeavours would be made to optimise CSS mobilisation and deployment, BHP have applied a conservative response timeframe for the mobilisation and deployment of the CSS of 16 days, accounting for unforeseen circumstances and providing a high degree of confidence in the success of the response strategy.

N.B. The Stickle-4H1 Oil Spill Modelling Report (GHD, 2021) applied a highly conservative capping timeframe of 25 days. Therefore, the successful deployment of the CSS by day 16 would yield a higher environmental benefit by further limiting 9 days of crude release compared with that modelled.

**Legislative and Other Considerations – Capping Stack**

The Heavy Lift Vessel (HLV) vessel engaged to deploy the Capping Stack System (CSS) will require an Australian Safety Case (accepted by NOPSEMA).

Via vessel tracking software, BHP shall prioritise the engagement of a HLV with existing Safety Case provided deployment times are not significantly impacted.

In the event that the CSS is mobilised via HLV without a current Australian Safety Case, BHP shall engage suitably qualified HSE professionals with relevant petroleum industry experience to facilitate and assist in approval development, revision, and submission on a 24 hour / 7 days a week basis following HLV engagement until all required approvals are in-force.

**ALARP Evaluation – Capping Stack**

| Controls | | | | ALARP Evaluation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from lack of response. | No well containment via Capping stack system (CSS) | Do nothing option. – no deployment of capping stack | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option. Halting the release of hydrocarbons and spill clean-up activities are essential. | The do-nothing option is not considered acceptable. Whilst CSS deployment has limitations due to environmental conditions CSS remains a valid source control strategy. | **Reject:** Source control is a recognised strategy for the mitigation of oil spill impacts. |
| **Substitute** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **Engineer** | Deployment of CSS not feasible due to physical / mechanical obstruction | SFRT Debris Clearance (see Response Strategy RS 1.5) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Capping stack system (CSS) mobilisation & vertical deployment – single vessel | Primary containment strategy | CSS available from OSRL | 1 | 10-16 days (OSRL Singapore) | High | H | H | M | H | H | Installation of CSS provides net benefit. 0.6 MMSTB crude oil prevented from entering marine and coastal environments assuming 16-day well capping compared with 69-day relief well operation. | Deployment deemed feasible but dependant on favourable environmental conditions | **Accept:** Control to form component of response strategy. |
| | Vessel with insufficient capability to deploy CSS | HLV with min 130tn crane capacity & active heave compensation | HLV capability requirements met | Multiple (open market) | 1 | 3 days (Singapore) | High | H | H | H | H | H | Enabling installation of CSS provides net benefit. | Contracting & availability of suitable deployment vessel | **Accept:** Control to form component of response strategy. |
| | Vertical installation of CSS via multiple vessels not feasible / unsafe | Offset Installation Equipment (OIE) deployment | Secondary CSS deployment strategy | OIE available from OSRL | 1 | 40+ days (OSRL Italy) | High | L | H | L | H | H | Deployment times result in limited benefit given reservoir depletion rate. | Operable from 75 m water depth. Timeframe to deploy provides limited opportunity when compared with relief well. | **Reject:** Control deployment timeframes providing limited benefit when compared with relief well. |
| | | Pre-position CSS in region / field | Expedited deployment of CSS – reduced mobilisation time | N/A | N/A | Approx. 7 days (theoretical) | High<br>(~$15M+) | L | N/A | N/A | N/A | N/A | Some potential environmental benefit gained with reduced mobilisation time approx. Deployment vessel contracting still required. | Under contract terms CSS remains in state of readiness at strategic global locations. No alternate CSS available. Cost to design & construct prohibitive given ready availability of industry equipment. | **Reject:** Control not available & cost to develop & construct grossly disproportionate to potential benefit gained. |
| **Separate** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H): Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Administrate** | Insufficient information / planning to mobilise & deploy capping stack system may extend duration of hydrocarbon flow | BHP Australia Source Control Plan Emergency Response Plan (SCERP) including Capping Stack Mobilisation Plan | Pre-planning enables ready mobilisation and deployment.<br><br>Consistent with industry good practice, BHP corporate requirements, IOGP Report 592 | SCERP in place prior to undertaking activity | 1 | Immediate (upon initiation of BHP IMT SCS) | Low | H | H | H | H | H | 0.6 MMSTB crude oil prevented from entering marine and coastal environments assuming 16-day well kill compared with 69-day relief well operation. | SCERP aligned with IOGP / APPEA guidance ready for immediate implementation. Common language enables ease of implementation. | **Accept:** Control to form component of response strategy. |
| | No contract(s) in place to enable CSS deployment | BHP maintain contract with well control service provider | Enables access to CSS and special personnel | Service agreement in place with OSRL | 1 | Immediate (upon initiation of BHP IMT SCO) | Low | H | H | H | H | H | Enabling installation of CSS provides net benefit. | Contract(s) in place | **Accept:** Control to form component of response strategy. |
| | | BHP signatory to APPEA MoU: Mutual Assistance | Enables best endeavours access to regional industry equipment & personnel | MoU in place | 1 | Immediate (upon initiation of BHP IMT SCS) | Low | H | H | H | H | H | Enabling installation of CSS provides net benefit. | APPEA MoU in place | **Accept:** Control to form component of response strategy |
| | BHP unable to contract HLV to deploy CSS in a timely manner | HLV under contract to transport & deploy CSS | Expedited transport & deployment of CSS – reduced procurement & mobilisation time | Multiple (open market) | 1 | N/A | High<br><br>(~ $10M+) | N/A | N/A | N/A | N/A | N/A | Enabling installation of CSS provides net benefit. | Cost to maintain vessel on standby grossly disproportionate to potential environmental benefit gained given ready availability of vessel on open market. | **Reject:** Cost to have vessel on standby grossly disproportionate to potential benefit gained. |
| | | Monitoring of HLV status on market via Vessel Broker | Assured access to suitable HLV in timely manner | Multiple (open market) | 1 | Prior to activity | Low | M | H | H | H | H | Enabling installation of CSS provides net benefit. | Vessel Brokerage services readily available and routinely used by BHP | **Accept:** Control to form component of response strategy. |
| | Introduction of invasive marine species (IMS) to response area | IMS Risk Assessment applied to HLV prior to CSS deployment | Prevention of introduction of IMS | IMS Risk Assessment in place | 1 | Immediate (upon vessel contract) | Low | H | H | H | H | H | Benefit in IMS introduction prevention | IMS Risk Assessment in place | **Accept:** Control to form component of response strategy. |
| | Suitably trained responders unavailable | BHP maintain contract with well control service provider | Enables access to special personnel | Service agreement in place with OSRL | 1 | Immediate (upon initiation of BHP IMT Source Control Section) | Low | H | H | H | H | H | Enabling installation of CSS provides net benefit. | Contract(s) in place | **Accept:** Control to form component of response strategy. |
| | No Safety Case in place for implementation of response | Monitoring of HLV status on market via Vessel Broker includes:<br>• Vessel availability<br>• Vessel safety case status & scope | Monitors available vessel and prioritises those with Australian Safety Case | Multiple (open market) | 1 | Prior to activity | Low | H | H | M | H | H | Enabling installation of CSS provides net benefit. | Vessel Brokerage services readily available and routinely used by BHP | **Accept:** Control to form component of response strategy. |

PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | SIMOPS plan in place covering capping stack deployment operations | Covered in SCERP | | | | Low | H | H | H | H | H | | | **Accept:** Control to form component of response strategy. |

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### 7.2.6 Source Control – Subsea First Response Toolkit (SFRT / SIRT) (RS1-5)

**Summary of Activity – SFRT / SIRT (Tier 2)**

The basis of assessment for subsea first response toolkit source control relates to the potential subsea release of crude oil from a loss of containment from the Stickle-4H1 well as per Table 3-1.

The Source Control – Subsea First Response Toolkit (SFRT) / Subsea incident Response Toolkit (SIRT) response strategy will be implemented for Level 3 spills only. The SFRT / SIRT is a subsea dispersant and debris clearance toolkit allowing debris to be cleared around the area of the wellhead, to enable intervention and prepare relief well drilling and safe installation of the well capping or containment device.

Subsea chemical dispersants, injected via an ROV with a dispersant wand, may be applied to assist with the installation of the Capping Stack by reducing volatile organic compounds at surface. Pending the successfully installed and operation of a capping stack system, the use of subsea chemical dispersants will no longer be required.

The Source Control – SFRT / SIRT response strategy will require support from OSVs for the duration of the response activities.

Source Control – SFRT activities will include:

- Establishment of the Source Control Section (SCS): SIMOPS Group embedded within the BHP IMT;
- Implementation of the *BHP Source Control Emergency Response Plan* inclusive of a Subsea Intervention Plan;
- Notification of incident to AMOSC, to request mobilisation of SFRT with dispersant stockpile from Fremantle and OSRL, to requests SIRT from Norway (if required);
- Activation of agreements to mobilise OSVs;
- Mobilisation of resources (including BHP Drilling personnel) to oversee subsea operations; and
- Implementation of the SCERP.

In conjunction with concurrent source control activities, if initial source control actions have not been successful in halting subsea release and if Operational SIMA demonstrates a net environmental benefit, activate RS3 Dispersants Response Strategy for application of subsea dispersants (refer to Section 7.2.9).

**Potential Environmental Impact and Risks – SFRT / SIRT**

There are no additional environmental impacts and risks associated with a vessel-based response in offshore waters to those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for ‘Offshore Response Operations’.

The environmental impact and risk evaluation for the use of subsea dispersants is provided in Appendix B – Dispersant Application Risk Assessment.

**Response Arrangements – SFRT / SIRT**

**AMOSC Equipment (SFRT)**

As a member company, BHP has access to the Subsea First Response Toolkit (SFRT) including debris clearance and SSDI equipment and dispersant stockpiles located in Fremantle, Western Australia and maintained by Oceaneering. Oceaneering maintain support staff to facilitate the mobilisation, deployment, and operation of the SFRT.

**OSRL Equipment (SIRT)**

BHP’s subscription to the OSRL SWIS Supplementary Agreements provides BHP with access to 2x Subsea Incident Response Toolkits (SIRT), with the approval to mobilise one per incident, which are each an integral part of capping operations. OSRL support staff are available to facilitate the mobilisation, deployment, and operation of the SIRT.

Each SIRT provides equipment that can be used for Debris Clearance, BOP Emergency Intervention and the Subsea Dispersant Injection kit for application of any selected hydrocarbon dispersants directly at the wellhead/BOP/CS.

The primary OSRL package for BHP would be the SIRT located at Oil Spill Response (SWIS) Norway AS facilities in Tanager, Norway.

**Deployment Vessel**

The SFRT / SIRT can be deployed from a routinely available dynamically positioned (DP) offshore support vessel (OSV) with 'Work-Class' ROV capability. BHP has standing contracts in place to access such vessels.

**Minimum Vessel Specification**

Minimum specifications for the SFRT / SIRT deployment vessel are:

- DP2 capability
- Min (2) Medium Work Class ROVs with capability to reach mud line at incident well centre and survey 50 m radius around well centre with carrying capacity:100 kg
- Active heave compensated crane with minimum 20t mud line capacity
- Minimum 750 $m^2$ deck space
- Deck tote tanks can be used, but below deck bulk storage is preferred for dispersant storage.

**Response Timing – SFRT**

BHP have determined the SFRT can be mobilised to the Pyrenees Field within 4 days.

**Legislative and Other Considerations – SFRT / SIRT**

The application of chemical dispersants is considered in Section 7.2.9.

## ALARP Evaluation – SFRT / SIRT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Implementation Time | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from the execution of this response strategy. | No SFRT / SIRT used | Do nothing option. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environmental benefit would be gained from this option. Enabling the deployment of subsea response equipment is essential. | The do-nothing option is not considered acceptable unless there is not damage or debris encountered that would prevent other response strategies. | **Reject:** Source control is a recognised strategy for the mitigation of oil spill impacts. |
| **Substitute** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **Engineer** | Deployment of CSS not feasible due to physical / mechanical obstruction | SFRT Debris Clearance | Enable the installation of CSS / Containment equipment<br><br>Designed for first intervention for well<br><br>Cutting tools ROV pressure washing tools<br><br>SSDI equipment | SFRT AMOSC<br><br>SIRT (OSRL) | 2+ | SFRT 4 days (AMOSC Fremantle) | Moderate | H | H | H | H | H | Enabling installation of CSS provides net benefit. | Equipment readily available and deployable | **Accept:** Control to form component of response strategy. |
| **Separate** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **Administrate** | Insufficient information / planning to mobilise & deploy debris clearance & SSDI equipment subsequently hamper capping stack deployment or vessel intervention operations. | SCERP including subsea intervention Plan | Pre-planning enables ready mobilisation and deployment. | SCERP in place prior to undertaking activity | 1 | Immediate (upon initiation of BHP IMT Source Control Section) | Low | H | H | H | H | H | Enabling installation of CSS provides net benefit. | SCERP aligned with IOGP / APPEA guidance ready for immediate implementation. Common language enables ease of implementation. | **Accept:** Control to form component of response strategy. |

### 7.2.7 Source Control Preparedness Performance Standards

| Spill Response Preparedness – Source Control | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to implement source control in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| SOPEP / SMPEP | All vessels contracted to BHP shall have a MARPOL-compliant SOPEP / SMPEP (suitable to class) | Completed Vessel Assurance Questionnaire for each response vessel prior to entering field demonstrating compliance with MARPOL Annex I (Prevention of Pollution by Oil) | BHP Logistics Supervisor |
| APPEA Memorandum of Understanding: Mutual Aid | BHP shall be a signatory to the APPEA Memorandum of Understanding: Mutual Aid to enable access to industry resources. | APPEA MoU: Mutual Aid signed by BHP | APU Operations Manager |
| MODU equipment | Consistent with APIS53, the BOP aboard the MODU shall contain at least one annular sealing element and one blind-shear ram capable of shearing and then sealing the wellbore; and contain at least four rams, one of which shall have shear capability, and a 'hot-stab' connection enabling activation via ROV. | MODU specifications | Head of Drilling & Completions - Australia |
| | The contracted MODU is fitted with a 'Work – Class' ROV | MODU specifications | Head of Drilling & Completions - Australia |
| BHP Australia Source Control Plan Emergency Response Plan (SCERP) including subsea intervention plan | BHP shall develop a SCERP consistent with IOGP Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019) and APPEA Australian Offshore Titleholder's Source Control Guideline (June 2021). The SCERP shall include:<br>• A subsea intervention plan;<br>• A relief well plan; and<br>• A capping stack mobilisation and deployment plan. | Documented SCERP consistent with the International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019) and APPEA Australian Offshore Titleholder's Source Control Guideline (June 2021) | Head of Drilling & Completions - Australia |
| Monitoring of vessel availability & status | BHP shall actively monitor current heavy lift vessel (HLV) market availability through Clarkson's Sea/response software platform via OSRL to identify emergency vessels and equipment most suitable for source control operations, including capping stack deployment, and those that are closest to the incident location. Considerations for engagement of a HLV to include:<br>• location & availability / readiness to respond<br>• technical specifications / capability to undertake scope of response<br>• Australian Safety Case status & Scope of Validation<br>• Pathway to having Safety Case / Scope of Validation (if required) | Clarkson's report | Head of Drilling & Completions - Australia |
| | BHP shall monitor regionally available OSV with 'Work-Class' ROV capability and availability shall be verified prior to undertaking drilling activities. | Vessel monitoring records | BHP Logistics Supervisor |
| Monitoring of MODU availability & status | BHP shall monitor the status of alternate MODU along with AHTS vessels located regionally on a monthly basis during the activity. | Monthly MODU status reports | Head of Drilling & Completions - Australia |
| | BHP shall actively monitor current MODU market availability through an independent market analyst and MODU broker assistant service. Considerations for engagement of alternate MODU include:<br>• location & availability / readiness to respond<br>• technical specifications / capability to undertake scope of response<br>• Australian Safety Case status & Scope of Validation<br>• Pathway to having Safety Case / Scope of Validation (if required) | MODU Broker reports | Head of Drilling & Completions - Australia |
| Personnel | BHP shall maintain HSE / Technical capability internally to support the development of Safety Case for potential international MODU as required | Internal staffing records | APU Operations Manager |
| Relief well equipment | BHP shall maintain casing and wellhead inventories to ensure there is always equipment readily available to drill a relief well. | Documented inventory of available casing and wellhead equipment | Head of Drilling & Completions - Australia |
| Specialist Service Providers | BHP shall maintain Master Service Agreements (MSA) for specialist assistance for engineering and operational support for relief well planning and execution. | MSA records | Head of Drilling & Completions - Australia |
| OSRO Service Contract | BHP shall have a contract in place with both AMOSC and OSRL to enable access to industry response equipment. | Service contract with OSRL<br>AMOSC membership | APU Operations Manager |

| Spill Response Preparedness – Source Control | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to implement source control in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| Well Control Training | BHP Well & Seismic Delivery (WSD) Staff shall hold supervisory-level certificate from a well control accredited program (IWCF or IADC WellSharp). | WSD training records | Head of Drilling & Completions - Australia |
| BHP Relief Well Planning and Blowout Dynamic Kill Simulation | BHP shall develop a Relief Well Planning and Blowout Dynamic Kill Simulation, consistent with OGUK guidance, details the planning of the relief well for subsea blowout scenarios on the Crosby and Stickle development wells to enable a relief well to be implemented in the shortest timeframe practicable.<br>The simulation shall determine the kill mud weights, pump rates and power requirements for potential kill scenarios and if the drilling of one single relief well is sufficient for the well kill operations.<br>Plan inclusive of:<br>• Detailed relief well modelling;<br>• Reservoir parameters;<br>• Analysis of shallow hazards;<br>• Relief well surface location and design (including casing requirements); and<br>• Dynamic kill modelling via seawater and/or kill weigh drill fluid | Document Relief Well Planning and Blowout Dynamic Kill Simulation, consistent with OGUK guidance | Head of Drilling & Completions - Australia |
| Relief Well Proposed Mooring Pattern | Prior to initiating relief well operations with an alternate MODU, BHP shall develop a detailed mooring plan including consideration of:<br>• 8- or 12-point mooring system required;<br>• Results of shallow hazards assessment;<br>• Existing Pyrenees field infrastructure;<br>• Proposed anchor and mooring line locations; and<br>• Mooring equipment tensioning requirements | Mooring Plan document | Head of Drilling & Completions - Australia |
| Testing / Exercising | BHP shall undertake a desk-top exercise against the spill response testing objectives detailed within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) prior to undertaking the activity including validation of source control response readiness. | Exercise records | Lead Principal HSE |
| Response Timing | BHP shall maintain arrangements to enable best endeavours drilling of a relief well within 49 days of a LOWC event (pending regionally available MODU) to 69 days should an international MODU be required. | Exercise records confirm arrangement in place to enable best endeavours relief well operations within modelled timeframes | Head of Drilling & Completions - Australia |
| | BHP shall maintain arrangements to enable best endeavours mobilisation and deployment of a CSS within 16 days of a LOWC event. | Exercise records confirm arrangement in place to enable best endeavours CSS deployment within modelled timeframes | Head of Drilling & Completions - Australia |
| | BHP shall maintain arrangements to enable best endeavours mobilisation of the SFRT within 4 days of a LOWC or pipeline rupture event. | Exercise records confirm arrangement in place to enable best endeavours SFRT mobilisation within modelled timeframes | Head of Drilling & Completions - Australia |

- Contracted vessel having a vessel specific SOPEP / SMPEP meets MARPOL Annex I (Prevention of Pollution by Oil);
- BHP minimum standards for BOP design and functionality are consistent with API Standard 53: Well Control Systems for Drilling Wells;
- Source control planning arrangements are consistent with industry good practice, namely International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019) and APPEA Australian Offshore Titleholder's Source Control Guideline (June 2021);
- The APPEA Memorandum of Understanding: Mutual Aid is an Australian Petroleum Industry recognised mechanism to access regionally available response equipment including an alternate MODU on a best endeavours basis;
- A detailed ALARP evaluation has been undertaken including an assessment of alternate and improved options and BHP has adopted an approach to implement source control in the shortest reasonably practical timeframes; and
- Given the multiple spill response preparedness measures detailed within this section, BHP consider the Environmental Performance Outcome of 'BHP prepared to implement source control in an effective and timely manner' can be achieved.

### 7.2.8 Monitor and Evaluate (RS2)

**Summary of Activity – Monitor and Evaluate (Tier 1 – Tier 2)**

The basis of assessment for both aerial and vessel surveillance relates to the maximum lineal distance (km) floating oil >1 $g/m^2$ (Table 4-2). For an MDO release, this equates to 365 km (Figure 4-3) and for a LOWC event up to 1,700 km (Figure 4-1).

The Monitor and Evaluate response strategy is applicable for Level 2–3 spills and is mandatory for real-time decision-making during a large spill event. This includes an assessment of the location, weather and sea state conditions, volume of oil released, oil weathering state, and trajectory of the spill. Monitoring results inform the operational SIMA process for selecting alternate strategies for responding to and managing a spill event, such as the chemical dispersant application.

Monitoring and evaluation requires access to aircraft, vessels, and personnel. In the event of a Level 2 / Level 3 spill, the following monitoring and evaluation methods will typically be implemented, dependent on the nature and actual or potential volume of the spill:

- Aerial surveillance;
- Vessel surveillance;
- Oil spill tracking buoys;
- Spill trajectory modelling; and
- Satellite imagery.

***Aerial Surveillance***

Aerial surveillance is activated by the Incident Commander or by a designated officer of the nominated Control Agency. Aerial surveillance will be by helicopter and/or fixed-wing plane. In addition to the aircrew, trained aerial surveillance observers will be aboard flights to confirm spill location, size and thickness. Information will be relayed to IMT for processing. A schedule of flights will be developed, to ensure sufficient timely information is available for fate modelling. Aerial observations will only be undertaken during daylight hours. The aerial surveillance will include digital imagery of the spill, the GPS coordinates of the spill extremities, an estimate of the spill thickness and the time of the observations.

***Vessel Surveillance***

Direct observations from the contracted MODU, AHTS vessels and/or ROV can be used to assess the location and visible extent of any immediate oil spill. Additional vessels used to verify modelling predictions and trajectories. Due to the proximity of observers to the water’s surface, vessel surveillance is limited in its coverage in comparison to aerial surveillance and may also be compromised in rough sea state conditions or where fresh hydrocarbons at surface pose a safety risks.

***Oil Spill Tracking Buoys***

Once deployed in field, Self-Locating Datum Marker Buoys (SLDMB) or Oil Spill Tracking Buoys (OSTBs) monitor the movement of hydrocarbons via satellite. Can be deployed via MODU, FPSO, vessel or helicopter.

***Oil Spill Trajectory Modelling***

IMT to engage RPS-APASA via a call-off contract maintained by AMOSC to initiate trajectory modelling and correlate it with real data received from aerial and vessel surveillance, OSTBs and/ or sea gliders. From these sources, RPS-APASA will develop an initial oil spill trajectory model for the next 5 days, which will allow the IMT to direct resources for the next phase of the response. Alternative oil spill modelling agencies may be selected dependent on operational requirements.

***Satellite Imagery***

Satellite imagery provides a supplementary source of information that can improve awareness of the extent, trajectory, and thickness of a slick. Suitable imagery is available via satellite imagery suppliers 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.

**Potential Environmental Impacts and Risks – Monitor and Evaluate**

There are no additional environmental impacts and risks associated with a monitoring and evaluation response in offshore waters to those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for ‘Offshore Response Operations’.

Potential environmental impacts and risks associated with nearshore monitoring and evaluation and mitigative control measures are summarised in Section 8.2 for ‘Nearshore Response Operations’.

**Response Arrangements – Monitor and Evaluate**

**Procedure(s)**

APU Oil Spill Response Strategy – RS2 Monitor and Evaluate (AOHSE-ER-0053)

APU Procedure – Operational Response Guideline 1: Aerial Surveillance. Confirmation, Quantification and Monitoring of Oil Spills (AOHSE-ER-0041)

APU Procedure – Operational Response Guideline 3: Oil Spill Trajectory Modelling. Initiation, Data Collection and Progression (AOHSE-ER-0044)

APU Procedure – Operational Response Guideline 4: Oil Spill Tracking Buoy – Deployment / Tracking (AOHSE-ER-0033)

**Aircraft**

BHP has a contract with CHC Helicopters in Karratha to provide 2 helicopters for crew change, 24/7 Medevac, and Search and Rescue coverage. CHC’s 2 helicopters can be used for aerial surveillance in event of an oil spill. See ‘Aerial Support’ Section 7.1.4.1 for additional information.

**Trained Aerial Observers**

Crew aboard the Pyrenees Venture FPSO can be deployed to undertake aerial observations.

Additional trained aerial observers are available to BHP from AMOSC. Additional trained aerial observers are available via OSRL in the event of a large/longer duration response.

**Oil Spill Tracking Buoys**

2 OSTBs are location in-field 1x on the Pyrenees FPSO & 1x on the MODU, during the Pyrenees Phase 4 Infill Drilling Program.

**Sea gliders**

BHP has a service agreement in place with a third-party preferred vendor for the provision of subsea surveillance (via sea gliders).

**Response Timing – Monitor and Evaluate**

Aerial surveillance – activate within 2 hours of forming BHP IMT.

Contracted crew change helicopter(s) could be diverted to the spill location immediately if safe to do so, providing it is not required for emergency evacuation related tasks from the MODU. Trained aerial observers are available to BHP from AMOSC. These personnel can be mobilised within 48 hours. Additional trained aerial observers are available via OSRL in the event of a large/longer duration response.

Vessel surveillance – activate within 2 hrs of forming BHP IMT.

Contracted AHTS vessels could be diverted from routine operations to undertake monitoring operations if safe to do so.

Oil spill tracking buoy – activate within 2 hours of spill (direct deployment from FPSO and / or MODU).

Oil spill trajectory modelling – activate via AMOSC within 2 hours of forming BHP IMT.

Sea gliders – mobilise within 7 days of spill.

| Controls | | | | ALARP Evaluation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) | | | | | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | | | |
| **Eliminate** | Negative environmental impact from the execution of this response strategy. | No situational awareness. | Do nothing option | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option. Developing a monitoring and evaluate response strategy is a necessary contingency to have in place prior to and during operations and cannot be eliminated. Monitoring and evaluation is integral to the management and verification of spill response strategies for all spill scenarios. | The do-nothing option is not considered acceptable. | **Reject:** The monitor and evaluate strategy is a mandatory response strategy to have in place and cannot be eliminated. |
| **Substitute** | None identified | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Engineering** | No available fixed wing aircraft | Dedicated monitoring aircraft on standby | Immediate response deployment via dedicated aircraft | N/A | N/A | <2 hours | High approx. $100,000 per month | N/A | N/A | N/A | N/A | N/A | BHP has contract with CHC Helicopters in Karratha to provide 2 helicopters that could be called upon to undertaken aerial monitoring. Additional aircraft available via AMOSPlan. | The cost to maintain dedicated fixed wing aircraft would be approx. $100,000 per month, per aircraft. The cost to maintain a single, or multiple dedicated fixed wing aircraft is not considered reasonable, as BHP's current arrangements enable aerial surveillance (daylight only). | **Reject:** aircraft under contract and available. |
| **Separate** | None identified | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Administrate** | Response strategy executed ado with no real planning. | Monitor and evaluate operations to be reviewed and managed by IMT through Incident Action Plan (IAP) process. | Within the first 24 hours, BHP IMT will enact the first strike plan in conjunction with development of an IAP. | N/A | N/A | <24 hours | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective monitor and evaluate response activities to track the spill trajectory and to feed into real-time decision-making for further strategies for responding to and managing spill event. The review/evaluation of monitor and evaluate options will be implemented immediately for all levels of spills. | Controls have High effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for the operation. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |
| | Spill trajectory not known in early stages of the response. | Spill fate modelling initiated within 2 hours of IMT forming to support Operational SIMA. | Used as tool to gain situational awareness through real-time spill trajectory modelling to enable evaluation of which sensitive receptors require priority protection. | A | N/A | <2 hours from IMT forming | Minor | H | H | H | H | H | Positive environmental benefit gained as oil spill trajectory modelling will enable real-time evaluation of which sensitive receptors require priority protection. | | |

**PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT**

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) | | | | | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | | | |
| **Administrate** | Aerial surveillance resources not available. | Contract in place with CHC helicopters and backup by Babcock helicopters. | BHP contract in place for the provision of aerial surveillance mobilising from Karratha (or alternatively from Barrow Island) in the event of a hydrocarbon spill. | N/A | 2 | <2 hours | Minor | H | H | H | H | H | Positive environmental benefit gained from having aircraft/ vessels already on contract or readily obtained through MOUs for spill surveillance activities. Dependent on the size of the spill, vessel/ aerial surveillance would be initiated immediately. | The response capacity is small, but the effectiveness is generally High (vessel operations are only possible during daylight hours). The cost of using all available BHP marine vessels, those available through Mutual Aid and on the local spot-charter market in Exmouth / Dampier / Broome has minor cost implications. Cost during activation would be moderate. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Marine based resources (vessels) not available to respond when required. | Access to support vessels (BHP, mutual aid, local charter). | BHP Marine Fleet (Contracted OSV), Mutual aid MOU's (Santos / Woodside) and vessels of opportunity available on the local spot charter market in Exmouth, Onslow, and Dampier.<br><br>Vessels already on contract or readily obtained through MOU's, no additional standby cost. | N/A | 1-4 | 0-1 days | Moderate | H | H | H | H | H | | | |
| | Spill modelling resources not available. | Contract in place with AMOSC who maintains call-off contract with RPS-APASA* to provide spill modelling in the event of a hydrocarbon spill. | Real-time monitoring and evaluation of the spill is a mandatory primary response strategy implemented for Level 2 – 3 spills required for real-time decision-making during a spill event. BHP has agreements and contracts in place to expedite implementation of monitor and evaluate activities. | N/A | N/A | <24 hours | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. Oil spill trajectory modelling will be conducted to predict the extent of impacts to offshore habitat, for any physical disturbance that may impact shoreline, nearshore areas, or areas protected for the purpose of conservation. The IMT will engage RPS-APASA* via a call-off contract maintained by AMOSC to start modelling the spill and correlate it with real data received from aerial surveillance, OSTB and/ or sea gliders. | Control has High effectiveness; it is available, functional, and reliable and in general it is reliable and compatible with other control measures. Control has minor cost implications for operations. | |
| | Spill modelling not available within the needed timeframe and to the expected standard. | Ensure spill modelling capability meets and exceeds the industry standards for oil spill modelling. | | | | | | | | | | | From these sources, RPS-APASA will develop an oil spill trajectory model for the next 5 days, which will allow the IMT to direct resources for the next phase of the response. Alternative oil spill modelling agencies may be selected dependent on operational requirements. | Control has High effectiveness; it is available, functional, and reliable and in general it is reliable and compatible with other control measures. Control has minor cost implications for operations. | |
| | Tracker buoys not immediately available for deployment. | OSTB's located on MODU / FPSO deployed within 2 hours of spill incident. | BHP has access to OSTB's located on the MODU & FPSO | N/A | 2 | <2 hours deployment from MODU / FPSO | Moderate | H | H | H | H | H | Positive environment benefit by in-field tracking capability.<br>Immediate tracking of currants and associated hydrocarbons for effective decision-making | The response capacity is small for vessel operations, but the control effectiveness is | |

**PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT**

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | | | | | | | generally High (vessel operations are only possible during daylight hours). The cost of using all available BHP marine vessels is minor. Cost during activation would be moderate. | |
| | Real time monitoring arrangements not in place as part of response preparedness. | BHP has agreement in place with OSRL/ third party for the provision of satellite imagery. | Real-time monitoring and evaluation of the spill is a mandatory primary response strategy implemented for Level 2 – 3 spills required for real-time decision-making during a spill event. BHP has agreements in place to expedite acquisition of satellite imagery in the event of a spill. | N/A | N/A | < 24 hours for acquisition of first satellite image. | H | H | H | H | H | H | Positive environmental benefit by having access to monitor and evaluate resources obtained via contractual arrangements and service agreements with OSRL and other third-party vendors ensures activation of response strategy activities are expedited in the event of a spill. | The response capacity is minor, but the control effectiveness is generally High The cost of having agreements/contracts in place is minor. Cost during activation would be moderate. | |
| | Real time monitoring arrangements not in place as part of response preparedness. | Service agreement in place with third party preferred vendor for monitoring of subsea hydrocarbons (via sea gliders) during operations. | BHP has a service agreement in place with a third-party preferred vendor for the provision of subsea surveillance (via sea gliders). | N/A | N/A | 7 | H | H | H | H | H | H | Monitoring of subsea hydrocarbons serves as a potential trigger for environmental monitoring (refer to RS10: Environmental Monitoring):<br>-- Seabirds and migratory shorebirds;<br>-- Marine mammals and megafauna (inc. whale sharks);<br>-- Benthic habitats and primary producers;<br>-- Marine reptiles;<br>-- Commercial and recreational fisheries; and<br>-- Fish monitoring. | Response Strategy current for Pyrenees Operations OPEP and apply to the Pyrenees Phase 4 activity. Contracts already in place. | |
| | Response Strategy ceases early or continues with negative environmental impact. | Response strategy activities continued until termination criteria met. | Ensures that the response strategy continues until the performance outcome has been achieved. | | | | | | | | | | Positive environmental benefit gained from ensuring that the monitor and evaluate response strategy continues until the performance outcome has been achieved. | | |
| | Aerial surveillance resources not available. | Aerial observers from Pyrenees Facility. | BHP employees and contractors on roster at Pyrenees Facility. | N/A | 4 | <4 hours | Minor | H | H | H | H | H | Positive environment benefit by having vessels already on contract and mobilised from Pyrenees Facility. | The response capacity is small, but the control effectiveness is generally High. The cost of using all available BHP employees is minor. | |

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Administrate** | Aerial surveillance resources not available. | Access to aerial surveillance and trained observers from AMOSC Core Group or OSRL. | BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill. | N/A | Multiple | 24-48 hours | Moderate | H | H | H | H | H | Positive environment benefit gained from implementation of this control measure BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill. | Control is already in place for existing OPEPS (specifically Pyrenees Operations EP and OPEP) | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Marine based resources (vessels) not available to respond when required. | Dedicated oil spill response vessel on standby. | On standby 24/7 during operations to expedite monitoring | N/A | 1 | 0-1 | Moderate $35K/day x 120 days = ~$4.2M | H | H | L | H | H | Positive environment benefit gained by having dedicated aircraft/ vessels on standby to immediately monitor the spill. | Dedicated standby vessels have substantial costs that do not provide a measurable advantage over utilising assets already in the field during the activity. | **Reject**: This control has high costs that are disproportionate to any environmental benefit that might be gained. This takes into consideration additional fuel required for having vessels on standby at site. |

| Spill Response Preparedness – Monitor and Evaluate | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to undertake monitoring and evaluation in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| APPEA Memorandum of Understanding: Mutual Aid | BHP shall be a signatory to the APPEA Memorandum of Understanding: Mutual Aid to enable access to industry resource. | APPEA MoU: Mutual Aid signed by BHP | APU Operations Manager |
| Service Contract | BHP shall maintain a service agreement for 2 crew-change helicopters to support the Pyrenees Phase 4 Infill Drilling Program. | Service agreement with aircraft operator | APU Operations Manager |
| | BHP shall have a contract in place with OSROs to facilitate access to:<br>• Fixed-wing aircraft<br>• Oil Spill tracking buoys<br>• Trained aerial observers<br>• Oil spill trajectory modelling<br>• Oil spill observation satellite imagery | Service contract with OSRL<br>AMOSC membership | APU Operations Manager |
| | BHP shall have a service agreement in place with a third-party preferred vendor for the provision of subsea surveillance (via sea gliders). | Service agreement in place | APU Operations Manager |
| Monitoring of vessel availability & status | BHP shall monitor regionally available OSV with 'Work-Class' ROV capability and availability shall be verified prior to undertaking drilling activities. | Vessel monitoring records | BHP Logistics Supervisor |
| OSTBs | BHP shall maintain a minimum of 2 OSTBs 1x on the Pyrenees FPSO & 1x on the MODU, during the Pyrenees Phase 4 Infill Drilling Program. OSTBs shall be function tested prior to undertaking the activity. | Inspection records | Head of Drilling & Completions - Australia / FPSO Offshore Installation Manager |
| Testing / Exercising | BHP shall undertake a desk-top exercise against the spill response testing objectives detailed within the Pyrenees Phase 4 Infill Drilling Program EP (BHPB-04PY-N950-0021) prior to undertaking the activity including validation of monitoring and evaluation response readiness. | Exercise records | BHP Lead Principal HSE |
| Response Timing | BHP shall maintain arrangements to facilitate the mobilisation of monitoring and evaluation operations in accordance with the following timeframes:<br>• Aerial surveillance within 4 hours of forming IMT (via existing contracts)<br>• Vessel surveillance within 2 hours of forming IMT (via in-field vessels)<br>• Oil spill tracking buoys deployed within 2 hours of spill event<br>• Sea gliders deployed within 7 days of spill event<br>• Spill Trajectory Modelling initiated within 24 hours of forming IMT<br>• Satellite imagery initiated within 2 hours of forming IMT | Exercise records | APU Operations Manager |

**Demonstration of Acceptability – Monitor and Evaluate**

- A detailed ALARP evaluation has been undertaken including an assessment of alternate and improved options and BHP has adopted an approach to undertake monitoring and evaluation in the shortest reasonably practical timeframes; and
- Given the multiple spill response preparedness measures detailed within this section, BHP consider the Environmental Performance Outcome of 'BHP prepared to undertake monitoring and evaluation in an effective and timely manner' can be achieved.

### 7.2.9 Chemical Dispersant Application (RS3)

**Summary of Activity – Chemical Dispersant Application (Tier 2 – Tier 3)**

The basis of assessment for both surface and aerial dispersant application relates to the instantaneous area ($km^2$) with floating oil >50 $g/m^2$ (>50 µm) (Table 4-2). For an LOWC event, this equates to 150 $km^2$ (Figure 4-1 and Figure 4-2).

Dispersant application is a globally recognised and practiced response strategy, recognised under the Australian National Plan and, if used correctly, can greatly facilitate the protection of sensitive shorelines and other resources.

In the event of a Level 2 or Level 3 crude oil spill, three potential application methods that may be utilised should a decision to apply dispersant be made:

1. Subsea dispersant injection (SSDI) via industry supplied SSDI system as part of the SFRT/SIRT;
2. Surface dispersant application (SDA) via Fixed Wing Aerial Dispersant (FWAD) capability; and
3. SDA via vessel-mounted spray equipment.

The strategic SIMA for Stickle crude determined that Surface Dispersant Application (SDA) will likely have a net environmental benefit by significantly reducing the total volumes of shoreline loading across all shorelines, whilst SSDI is unlikely to have a net environmental benefit. However, SSDI may be applied with the intention of reducing volatile organic compounds (VOCs) at surface to aid in the deployment of SFRT and / or Capping Stack.

Dispersant is not recommended for marine diesel oil (MDO) spills.

Surface dispersant application is adopted to break surface oil slicks into fine droplets that then disperse into the water column below entrained thresholds that may impact marine fauna and other sensitive receptors. This reduces the effect of surface oil from being driven by wind towards shore and promotes biodegradation of the oil in the water column, preventing or limiting oil contact with sensitive environmental receptors.

While dispersants reduce surface oil, thereby providing protection for sensitive receptors, they also increase the amount of dispersed oil in the immediate vicinity where it is applied. This will result in a larger magnitude of impact to sensitive receptors (if present) to dispersed oil than would have occurred if dispersant had not been applied. Further, dispersants are known to have their own toxic properties, have varying efficacy on different types of crude oil, and the physical process of applying dispersant has its own set of impacts and risks. For these reasons, dispersants must only be applied in accordance with a carefully considered strategy, which considers both the benefits and impacts, and risks associated with applying it in a particular situation.

**Potential Environmental Impacts and Risks – Chemical Dispersant Application**

Refer to Appendix B – Dispersant Application Risk Assessment.

**Oil Spill Budget – Chemical Dispersant Application**

The detailed oil spill budget presented in Section 6.3.2 (SDA) and 6.3.3 (SSDI) is summarised as:

- Total dispersant required if initiating SDA in isolation = 6,365 $m^3$
- Total dispersant required if initiating SSDI in isolation = 1,545 $m^3$

However, by BHP initiating a combined response strategy and assuming the successful deployment of the CSS within define timeframes, the oil spill budget presented within Section 6.3.4 (Source Control + SSDI + SDA) applies and is summarised as:

- Total dispersant required if initiating Source Control in combination with SDA = 3,306 $m^3$
- SSDI is likely to be an ineffective response strategy to reduce surface oiling and subsequent shoreline loading (see Section 6.3.3), however, if applied in combination with the above at a conservative application ratio of 1:80 an additional 1,545 $m^3$ dispersant may be required.

With all combined response strategies, the total dispersant required may be up to 4,851 $m^3$.

**Response Arrangements – Chemical Dispersant Application**

**Procedures and Guidelines**

- APU Oil Spill Response Strategy – RS3 Dispersant Includes Fixed Wing Aerial Dispersant (AOHSE-ER-0054)
- APU Oil Spill Response Strategy – RS3 Marine Dispersant (AOHSE-ER-0055)
- APU Procedure – Operational Response Guideline 2: Dispersant Strategies, Safety, Application, Resources and Effectiveness (AOHSE-ER-0042)
- APU Oil Spill Dispersant Spray System (DSS) Application Procedure (AOHSE-ER-0047)
- Oceaneering System Installation and Operation Manual: Subsea Dispersant System (970088281-DTS-SOM-001)
- Australian Marine Oil Spill Centre (AMOSC). 2016. Subsea Dispersant Injection (SSDI) Guideline for Australia
- International Petroleum Industry Environmental Conservation Association - International Association of Oil & Gas Procedures. 2016a. Dispersants: subsea application. Report 533.
- Industry Recommended Subsea Dispersant Monitoring Plan. API Technical Report 1152, Second Edition, November 2020.

**SDA Vessels Specification**

Preferred vessels specifications for dispersant application in WA and Commonwealth waters:

- minimum 20 m length – depending on operating environment and expected sea conditions
- deck space sufficient for 10x IBCs or single 10 $m^3$ ISO-tank
- be capable of utilising dispersant spray systems, such as fixed spray booms or AFEDO units

**SSDI Minimum Vessel Specification**

Minimum specifications for the SFRT / SIRT deployment vessel are:

- DP2 capability
- Min (2) Medium Work Class ROVs with capability to reach mud line at incident well centre and survey 50 m radius around well centre with carrying capacity:100 kg
- Active heave compensated crane with minimum 20t mud line capacity
- Minimum 750 $m^2$ deck space
- Deck tote tanks can be used, but below deck bulk storage is preferred.

**Water Column Monitoring (WCM) Equipment & Personnel**

BHP have access to WCM through the OSRL SWIS Capping subscription to complement existing equipment designed for the use of Subsea Dispersant Injection (SSDI) as a response option when relevant. Even if SSDI is not required as a response option, the WCM Equipment provides useful instrumentation and tools to enable sampling and monitoring in deep-water settings for Operational and Scientific Monitoring Plans (OSMP).

Designed for mobilisation on an offshore supply vessel of opportunity, the WCM equipment includes two 8 ft × 20 ft containers certified for offshore use by Det Norske Veritas (DNV) and the American Bureau of Shipping, powered during stand-by and functioning as shipboard workspaces during deployment. The equipment in each container enables in-situ sampling and monitoring in water depths up to 3,000 metres.

The WCM equipment is designed to be self-contained and mobilisation-ready, with an integrated Launch and Recovery System consisting of a 30-horsepower winch, A-frame, and skid (DNV certified by Lloyd's post-construction), equipped with an electro-mechanical cable to provide power and communication to the sensor and sampling equipment.

BHP has access to CSA Ocean Sciences services via OSRL framework agreement to undertake water column monitoring.

**Application Equipment**

Refer Section 7.2.5 for SSDI equipment within SFRT / SIRT.

The primary oil spill dispersant spray system (DSS 10HPP2) is stored in a dedicated work basket on the Pyrenees FPSO at F Module. This work basket is to be transferred to the OSV with Crane #2 Port Side.

A secondary dispersant spray system is stored in Exmouth (Exmouth Freight & Logistics) the spray system is to be transferred to the OSV at the Harold Holt Base jetty.

AMOSC maintains and stores oil spill equipment at Harold Holt Base. Systems stocked by AMOSC include the VIKO and AFEDO spray systems. Transfer of equipment stored in Exmouth to OSV's will be completed at the Harold Holt Base jetty.

**Fixed-Wing Aircraft**

The current FWAD arrangement in place which covers the entire Australian coastline is jointly managed by AMSA & AMOSC.

AMOSC's FWADC contract provides for 'wheels up' of 6 aircraft around Australia within 4 hours of activation.

There are a significant number of additional air tractors around Australia which do not form part of the FWADC contract (40 – 50 aircraft) that can be made available within relatively short timeframes (noting timeframes vary based on time of year and current operations, e.g., fire-fighting, and crop-dusting operations).

When triggered, the FWADC contract provides the following: Air Tractor AT802, pilot, Aerotech First Response Liaison Officer, an Air Attack Supervisor, an Aircraft Loading Officer, and transportation for all personnel to the nominated location.

The Air Attack Supervisor is typically identified as a key critical path role. AMOSC maintain an Air Attack Supervisor as part of the Aerotech First Response FWADC contract. Other personnel are available via AMSA and the National Response Team (traditionally from bushfire services).

An Air Attack Supervisor platform (helicopter or fixed wing) will need to be supplied by BHP, in the event BHP is the Control Agency for the spill. Aerotech First Response also have the capability to source this capability, if required. BHP would typically utilise a crew-change helicopter as the Air Attack Supervisor platform.

Dispersant stocks would be transported from the nearest AMOSC or other mutual aid stockpile.

**Dispersant Approved for Use**

The dispersants used will be approved under the Australian Government National Plan arrangements as listed on the Oil Spill Control Agents (OSCA) register or the transitional list, or otherwise approved through the dispersant selection process detailed below.

Consistent with selection of hazardous materials at facilities, where a product may be discharged to the environment, an assessment must be completed before the product is approved for mobilisation and subsequently approved for application.

The following dispersants will be automatically approved for mobilisation:

- Dispersants listed on the National Plan OSCA List https://www.amsa.gov.au/marine-environment/pollution-response/register-oil-spill-control-agents;
- Dispersants listed on the National Plan transitional list;
- With reference to the UK's Offshore Chemical Notification Schedule (OCNS) CHARM Model Algorithm Definitive Ranked List of Approved Products, dispersant with a HQ of Gold or Silver or Group E or D (CEFAS, 2001); and
- Substances listed on the OSPAR List of Substances Used and Discharged Offshore which are considered to Pose Little or No Risk to the Environment (PLONAR).

Table 7-2 provides the dispersants currently accepted for use, noting only Slickgone LTSW has had transitional acceptance withdrawn and is therefore not accepted for use.

**Dispersant Stockpiles**

Through contractual arrangements with AMOSC and OSRL, BHP has access to stockpiles of dispersant as listed in Table 7-2.

In the event of a Level 3 hydrocarbon spill, BHP IMT will liaise with its OSROs regarding production of 'Just in Time Dispersant' for deployment throughout the oil spill response. This will take into consideration the start-up, continuous production, and termination of production of relevant dispersant based on the requirements and status of the incident response. AMOSC have provided the following advice in relation to dispersant manufacture and mobilisation:

- Day 5 – 75 $m^3$ / day of Ardrox 6120;
- Day 12 – 115 $m^3$ / day of Nalco Corexit; and
- Day 15 – 108 $m^3$ / day of Dasic Slickgone NS.

**Table 7-2: Dispersant stockpiles by location & owner, as at July 2021#**

| Location | Owner* | Type | Amount ($m^3$) |
|---|---|---|---|
| Broome | AMOSC | Ardrox 6120** | 15 |
| Exmouth | AMOSC | Slickgone NS | 75 |
| North Geelong | AMOSC | Corexit 9500A** | 62 |
| North Geelong | AMOSC | Slickgone NS | 75 |
| Fremantle | AMOSC | Slickgone NS | 8 |
| Fremantle | AMOSC | Corexit 9500A** | 27 |
| Dampier | AMSA | Slickgone NS | 10 |
| Dampier | AMSA | Slickgone EW | 10 |
| Fremantle | AMSA | Slickgone NS | 48 |
| Fremantle | AMSA | Slickgone EW | 52 |
| Australia (excl. Dampier / Fremantle) | AMSA | Slickgone NS | 110 |
| Australia (excl. Dampier / Fremantle) | AMSA | Slickgone EW | 115 |
| Australia SFRT | AMOSC | Slickgone NS | 500 |
| Singapore | OSRL (SLA) | Slickgone NS | 339 |
| Singapore | OSRL (SLA) | Corexit 9500A** | 185 |
| Singapore | OSRL (SLA) | Slickgone LTSW*** | 21 |
| Singapore | OSRL (SLA) | Finasol OSR52 | 67 |
| Singapore | OSRL (SLA) | Corexit 9527 | 84 |
| Singapore | OSRL (SLA) | Slickgone EW | 18 |
| Singapore | GDS (OSRL) | Slickgone NS | 350 |
| Singapore | GDS (OSRL) | Finasol OSR52 | 350 |
| UK Southampton | GDS (OSRL) | Finasol OSR52 | 500 |
| UK Southampton | GDS (OSRL) | Slickgone NS | 500 |
| USA - Ft Lauderdale | GDS (OSRL) | Corexit 9500A** | 500 |
| France | GDS (OSRL) | Finasol OSR52 | 1500 |
| Brazil | GDS (OSRL) | Corexit 9500A** | 500 |
| South Africa - Cape Town | GDS (OSRL) | Finasol OSR52 | 800 |
| TOTAL (***transitional acceptance withdrawn) | | | 21 |
| TOTAL (accepted for use) | | | 6,800 |

# Exact volumes subject to change as stocks are rotated/ used / replaced due to operational and/or logistics requirements.
*Note: Only 50% of OSRO (OSRL, AMOSC) stockpiles are accessible to any one client.
**Note: Transitional acceptance applies to a limited list of dispersant products held in AMSA and AMOSC stockpiles as of 1 January 2012 that are deemed to be OSCA registered on the basis that they have met previous acceptance requirements. These may be made available and used for National Plan responses until used or disposed of.
***AMSA and AMOSC stocks of other dispersant products originally designated with transitional acceptance (Shell VDC, Tergo R40, Dasic Slickgone LTSW) have been removed from stockpiles and so transitional acceptance is withdrawn from these. They are no longer acceptable for use in Australian National Plan responses (AMSA, 2021).

### Response Timing – Chemical Dispersant Application

Table 7-3 outlines the timeframes for mobilisation of stockpiles of oil dispersant from their locations in Australia to Exmouth, the method of transport and the likely method of application.

**Table 7-3: Dispersant estimated deployment times to Exmouth**

| Location | Volume ($m^3$) | Transport | Application | Estimated Time to Application in Field |
|---|---|---|---|---|
| **Broome** | 15 | Road to Exmouth Marina | FWADC air tractors | 7-9 hours |
| **Exmouth, Naval Base** | 75 | Road to Exmouth Marina | FWADC air tractors | 7-9 hours |
| **AMOSC Fremantle/ Jandakot** | 20 | Road to Exmouth for load out at Exmouth Boat Harbour to support vessel or Learmonth. | Support vessel spraying system | 28 hours |
| | | | FWADC air tractors | 28 hours |
| | 250*** (SFRT) | Road to Exmouth from Fremantle for load out at Exmouth Boat Harbour to support vessel | SSDI via SFRT | 8 days |
| **AMOSC Geelong** | 137 | Road to Exmouth for load out at Exmouth Boat Harbour (Service Wharf) to support vessel or Learmonth. | Support vessel spraying system | 2 – 3 days |
| | | | FWADC air tractors | 2 – 3 days |
| **AMSA Australia** | 345 | Road to Exmouth for load out at Exmouth Boat Harbour (Service Wharf) to support vessel or Learmonth. | Support vessel spraying system | 2 – 7 days |
| | | | FWADC air tractors | 2 – 7 days |
| **OSRL** | 346.5* | Air to Learmonth | FWADC air tractors, OSRL C130 Herc | 1 week |
| **Just in Time Dispersant** | 75 / Day 5 - Ardrox<br>115 / Day 115 - Corexit<br>108 / Day 15 - Slickgone | Road to Exmouth for load out at Exmouth Boat Harbour (Service Wharf) to support vessel or Learmonth. | FWADC air tractors, OSRL C130 Herc | 1 week |
| **Global Dispersant Stockpile (OSRL)** | 5,000 | Air to Learmonth | FWADC air tractors, OSRL C130 Herc, Subsea. | >3 weeks** |

NB: Arrangements must be made to refuel aircraft at Learmonth Airport; typically, the Air Truck will require 1,200 litres of Jet-A1 on arrival Learmonth and uses 300 litres per hour in service.

* 50% of OSRL stockpile is accessible to any one client.

** Assumes delivery is staggered as required and that 700 $m^3$ is available for use on Day 11 via the Singapore GDS.

*** Half the SFRT dispersants stockpile (250m3) is available to be released for surface response from SFRT members

**Legislative and Other Considerations – Chemical Dispersant Application**

BHP Dispersant Application Zone:

Dispersant may only be applied under the following conditions:

- when daily SIMA identifies a positive benefit;
- within a 50 km radius around the Pyrenees Facility, in water depths greater than 50 m; and
- when there are no EPBC Act Listed migratory species evident in the immediate application zone; and
- within State jurisdiction following approval from WA DoT; and
- within Australian Marine Parks following approval from Director of National Parks (DNP); and
- within the Ningaloo Coast World Heritage Area following approval from the DBCA and DNP.

**PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT**

**ALARP Evaluation – Chemical Dispersant Application**

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Analysis | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from the execution of this response strategy | No dispersant application. | Do nothing option. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option; modelling with dispersant application shows that volumes of oil ashore are reduced when dispersants are applied to the sea surface. Dispersants work by breaking oil slicks into small droplets (i.e., the surface area to volume ratio of the oil is increased) that then disperse into the water column below entrained thresholds of concern for marine fauna and other sensitive receptors. This reduces the effect of oil from being driven by wind towards shore and promotes oil biodegradation of the oil in the water column, hence enabling prevention of contact with sensitive environmental receptors. | There may be occasions when dispersants are not applied during an oil spill response such as, for example, the presence of migratory EPBC listed species occurring within the dispersant application zone, but in general, the 'do nothing' option is not considered within the external context (e.g., stakeholder views) to be a viable option. | **Reject:** The use of dispersants is a recognised strategy for the mitigation of oil spill impacts. |
| **Substitute** | Environmental impact from dispersant use | Only dispersants with lowest toxicity to be used to treat an oil spill. | Reduce environmental effects by only selecting dispersants with lowest toxicity. | N/A | N/A | N/A | Minor | L | L | L | H | H | The objective of chemical dispersant application is to increase the surface area of the released oil by making the oil droplets smaller thereby increasing the potential for bacterial biodegradation to breakdown the hydrocarbons faster. In addition, dispersant application is intended to reduce concentrations of oil to below thresholds of concern faster than with natural weathering alone. | Dispersant efficacy relates to the dispersant type and oil characteristics that are treated. Not all dispersants have equal efficacy. Using dispersants with lowest toxicity does not guarantee best performance or a net environmental benefit. Those dispersants that have been tested have been chosen for the efficacy, their approval for use based on their environmental profile in Australian waters and availability for immediate use. | **Reject**: The control is not practicable, and it is possible that no environmental benefit may be gained. |
| **Separate** | Dispersant use in sensitive shallow water habitats | Dispersant application restricted to water depths exceeding 50 m. | Limit application of dispersant on sensitive shallow water habitats, e.g., not within Exmouth Gulf. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environment benefit gained by not applying dispersant in areas with a water depth of less than 50 m, thereby reducing the likelihood of impacts from dispersant and dispersed oil (through the application of dispersant) on sensitive shallow water habitats and receptors such as coral reefs, seagrasses, macroalgal beds and marine fauna such as fishes and cetaceans, by maximising the time for dispersal before contact and potentially reducing the concentrations of oil to below thresholds of concern. | Controls have high effectiveness; are available, functional, and reliable and in general are survivable and compatible with other control measures. Controls have minor cost implications for the operation. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Analysis | Practicability / Constraints | ALARP Summary |
| | | Dispersant application restricted to a Dispersant Application Zone with a 50 km radius around the Pyrenees Facility but not intercepting the Ningaloo Marine Park boundary. | Apply dispersants only on oil amenable to chemical dispersants within a defined area but that excludes sensitive areas such as the Ningaloo Marine Park or shallow water habitats around islands or within Exmouth Gulf. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environment benefit gained by not applying dispersant inside the boundary of the Ningaloo Marine Park thereby reducing potential impacts to sensitive receptors such as coral reefs, seagrasses, macroalgal beds and marine fauna such as fishes and cetaceans. | | |
| | Dispersant use when EPBC Act listed migratory are in the area | Operational control to prevent impacts on EPBC Act Listed migratory species. | If EPBC Act Listed migratory species such as humpback whales or whale sharks are observed in the immediate vicinity of dispersant operations as determined from situational awareness reports from the 'monitor and evaluate' response strategy and/or from the platforms applying dispersant, dispersant operations would cease until the animal has moved out of the area and has not been sighted for 30 minutes, unless advised otherwise by the WA DoT OSRC. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environment benefit gained by reducing the potential impacts associated with applying dispersant in areas where EPBC Act Listed migratory species have been observed, as determined from situational awareness reports. Operations would cease until the animal has moved out of the area and has not been sighted for 30 minutes to reduce the potential of interaction with dispersed oil. | | |
| **Administrate** | Dispersant use without a clear emergency plan or issued IAP's | Dispersant Operations to be reviewed and managed by IMT through Incident Action Plan (IAP) process. | Within the first 24 hours, the BHP IMT will develop IAPs. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of dispersant operations (subsea and surface dispersant) will take place almost immediately in the event of a Level 3 spill. The dispersant operations would be adapted based on real-time information regarding the spill incident: whether sea state and weather conditions are conducive to dispersant application, dispersant efficacy testing and applicability with other response strategies. | Controls have high effectiveness; are available, functional, and reliable and in general are survivable and compatible with other control measures. Controls have minor cost implications for the operation. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Analysis | Practicability / Constraints | ALARP Summary |
| | Response activities not considered in preparedness planning therefore not allowing for input into the SIMA. | Operational SIMA to include evaluation of requirement for implementation of subsea and surface dispersants. | Surface chemical dispersants will be applied if Operational SIMA indicates the implementation of Dispersants Response Strategy would provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors. | N/A | N/A | 2 hours from IMT formation | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational SIMA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors.Surface and subsea chemical dispersants will be applied if the Operational SIMA indicates the potential harm of dispersed oil and dispersants is less than leaving the oil untreated by dispersants; and if the implementation of the dispersant response strategy would provide a net environmental benefit to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors.The application of dispersants will also be evaluated based on the time of year of the spill. For example, should the spill occur during peak turtle nesting season (species-dependent, but generally occurs between September and March) or seabird nesting (peak October to January), consideration of implementing the dispersant response strategy in combination with other response strategies to maximise the reduction of surface oil and minimise the volume of oil reaching sensitive shorelines. Likewise, should the spill occur during peak coral spawning events (March-April), then the implementation of alternative response strategies other than dispersant application would be more likely, in order to minimise the concentration of dispersed oil (and dispersants) in the water column. | | |
| | Poor situational awareness and understanding of oil spill trajectory prior to dispersant application (i.e., oil could be heading out to sea). | Oil spill modelling contract in place to provide predictions of dispersed crude oil trajectory to be undertaken to support the Operational SIMA and activated within 2 hours of notification. | Used as tool to gain situational awareness through real-time spill trajectory modelling to enable evaluation of which sensitive receptors require priority protection. | N/A | N/A | 2 hours from IMT formation | Minor | H | H | H | H | H | Positive environmental benefit gained as dispersant may not necessarily be applied to released oil that is heading offshore and away from sensitive receptors. Likewise, dispersant will not be applied to oil in sensitive areas such as the Ningaloo and Muiron Islands Marine Park or their boundaries, or shallow water habitats around islands or within the Exmouth Gulf. Oil spill trajectory modelling will assist in the effective use of dispersant by directing dispersant to target areas and will also enable real-time evaluation of which sensitive receptors require priority protection. | | |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Analysis | Practicability / Constraints | ALARP Summary |
| | Poor understanding of the effectiveness of the dispersant application and its impact on the environment. | Environmental monitoring | Environmental monitoring to evaluate the concentration of entrained hydrocarbons; the effectiveness of applied dispersant; and the impact of hydrocarbons and dispersant on marine and shoreline habitats. | N/A | N/A | Immediately and on-going | Minor | H | H | H | H | H | Positive environmental benefit gained from adopting this control measure. Allows evaluation of the effectiveness of applied dispersant which feeds into on-going decision-making in relation to dispersant application (i.e., altering volumes of dispersant/ continue/ halt dispersant application). | | |
| | Poor understanding of the effectiveness of the dispersant application and its impact on the environment. | Dispersant efficacy testing of chemical dispersant/s. | Dispersant quick effectiveness test (efficacy testing including test spray) to confirm the use and viability of the dispersant available on site prior to application. | N/A | N/A | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. Enables justification that dispersant stocks are viable and useful in dispersing hydrocarbons released and will provide an indication that there will be a net environmental benefit of using dispersant. | | |
| | Poor 'hit rate' when spraying dispersant from aircraft. | Implementation of air attack supervision as part of dispersant application. | Spotter aircraft will be deployed to inform the dispersant spray crew when they are on target. | N/A | N/A | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. Directs dispersant spray crew to target areas, avoiding sensitive areas (such as the Ningaloo and Muiron Islands Marine Park, within the Exmouth Gulf and shallow water habitats around islands), and allows real-time evaluation of the effectiveness of applied dispersant which feeds into on-going decision-making in relation to dispersant application. Also assists in real-time evaluation of which sensitive receptors require priority protection. | | |
| | Poor understanding of the effectiveness of the dispersant application and its impact on the environment | Chemical dispersant/s confirmed to be acceptable for use in the marine environment. | Only dispersants approved under the Australian Government National Plan arrangements on the OSCA Register or transitional list or otherwise approved through BHP chemical selection procedure. | N/A | N/A | N/A | Minor | H | N/A | H | H | H | Positive environmental benefit gained from the implementation of this control measure. The dispersants used will be approved under the Australian Government National Plan arrangements as listed on the Oil Spill Control Agents (OSCA) register or the transitional list or otherwise approved through BHP chemical selection procedure. Dispersant stocks held by BHP, AMOSC and the National Plan are listed on the OSCA Register and are therefore considered to have met the standard for acceptable practice for use within the National Plan. | | |
| | Dispersant use in impacting state waters without permission. | Permission for dispersant application in or around State waters will be obtained prior to application. | In State waters, chemical dispersant must not be applied without consent from appropriate HMA (WA DoT). | N/A | N/A | N/A | Minor | H | H | H | H | H | Control is a request from WA DoT. | | |

PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Analysis | Practicability / Constraints | ALARP Summary |
| | Dispersant use in Australian Marine Parks (AMP) without permission. | Permission for dispersant application in or around AMPs will be obtained prior to application. | Chemical dispersant must not be applied without consent from Director of National Parks (DNP) | N/A | N/A | N/A | Minor | H | H | H | H | H | Requirement | | |
| | Dispersant use volumes unknown. | Volumes of dispersants applied will be recorded. | All dispersants will be logged and reported to Incident Commander. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by determination of the correct dosage of chemical dispersant prior to application and through the continual monitoring and adjustment of the dosage during application. Adopting this control measure will aid in reducing the potential impact of dispersant on sensitive receptors through the controlled and 'measured' application of dispersant. | | |
| | Dispersant use ceases early or continues with negative environmental impact. | Response strategy activities continued until termination criteria met. | Ensures that the dispersant application response strategy continues until the performance outcome has been achieved. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from ensuring that the dispersant application response strategy continues until the performance outcome has been achieved. | | |
| **Administrate** | Insufficient access to dispersant. | Access to dispersant stockpiles owned by BHP / AMOSC (in Exmouth, Fremantle, Dampier, and Geelong) and equipment through Mutual Aid MOU. | Mobilisation of AMOSC owned dispersant stockpile and equipment through Mutual Aid MOU from Exmouth / Fremantle / Geelong, and BHP stock from Dampier. | Large | See Table 7-2 | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective of dispersant application is to increase the surface area of the released oil by making the oil droplets smaller thereby increasing the potential for bacterial biodegradation to breakdown the hydrocarbons faster. In addition, dispersant application is intended to reduce concentrations of oil to below thresholds of concern faster than with natural weathering alone. | The response capacity is large, and the control effectiveness is generally high (cf. potential for weather downtime). BHP has access to this capability through contractual arrangements with AMOSC / OSRL. Control has minor cost implications for the operation. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Insufficient access to dispersant. | Access to Global Dispersant Stockpile via OSRL. | Mobilisation of OSRL dispersant stockpile from Singapore and other countries. | Large | See Table 7-2 | < 24 hours to mobilise; onsite > 7 days | Minor | L (due to time to mobilise) | H | H | H | H | | | |
| | Insufficient resources available to assist in the application of dispersant (vessels, aircraft) | Access to support vessels (BHP, mutual aid, local charter). | BHP Marine Fleet, Mutual aid MOU's and vessels of opportunity available on the local spot charter market in Exmouth.<br><br>Vessels already on contract or readily obtained through MoU's, no additional standby cost. | Large | Multiple | 0-1 | Moderate | H | H | H | H | L | The environmental benefit associated with vessel and aerial dispersant is considered to be significant. | The response capacity is small for vessel operations, but the control effectiveness is generally high (vessel operations are only possible during daylight hours, and SIMOPS in the same area with aerial operations is not possible) and the cost of using all available BHP marine vessels, those available through Mutual Aid and on the local spot- | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Analysis | Practicability / Constraints | ALARP Summary |
| | | | | | | | | | | | | | | charter market in Exmouth / Dampier / Broome has minor cost implications. Cost during activation would be moderate. | |
| | | Access to Fixed Wing Aerial Dispersant Contract (FWADC) includes provision of ground crew and air attack supervisors. | Activation of FWADC through AMOSC/AMSA. BHP is a participant member of AMOSC and therefore has access to this capability. | Large | multiple | 0-1 | Moderate | H | H | H | H | L | | BHP is a full member of AMOSC, and this service is available through AMOSC membership and can be called on if required. | |
| | | Access to OSRL Hercules C130. | Mobilisation of OSRL aircraft from overseas. | Large | 1 | 5 | Moderate | L (due to time to mobilise) | H | H | H | L | | BHP is a full member of OSRL, and this service is available through OSRL membership and can be called on if required. | |
| **Administrate** | Insufficient resources available to assist in the application of dispersant (vessels, aircraft) | Support vessels (Australia, SE Asia). | Acquisition of charter vessels on the spot-market from around Australia and/or SE Asia. | Medium | As required | 3-8 | Minor | H | H | H | H | H | The environmental benefit associated with vessel and aerial dispersant is considered to be significant. | The response capacity is small for vessel operations, but the control effectiveness is generally high (vessel operations are only possible during daylight hours, and SIMOPS in the same area with aerial operations is not possible) and the cost of using marine vessels available as required through the spot-charter market around Australia and SE Asia has minor cost implications. Cost during activation would be high. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H): Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Analysis | Practicability / Constraints | ALARP Summary |
| | | Fixed Wing Aerial Dispersant Contract (FWADC). | Activation of all air tractors available under the FWADC through AMOSC/AMSA. BHP is a participant member of AMOSC and therefore has access to this capability. | Large | 6 | 1-4 | Major | H | H | H | H | H | Scalable options for vessel and aerial dispersant operations involves accessing more vessels from around the regions, and all air tractors (AT802) and ground support staff available through the FWADC. | The response capacity is large aerial operations, and the control effectiveness is generally high (cf. less potential for weather downtime), but aerial operations are only possible during daylight hours, and SIMOPS in the same area with vessel operations is not possible). BHP has access to this capability through contractual arrangements with AMOSC. Cost during activation would be moderate to high. | |
| | Insufficient resources available to assist in the application of dispersant (vessels, aircraft) | Dedicated OSV vessel on standby in field. | On standby 24/7 during operations to expedite initiation of vessel dispersant application. | Small | 1 | 0-1 | Major $35K/day x 120 days = >$4.2M | H | H | L | H | L no SIMOPS with aerial applic'n | The environmental benefit associated with vessels on standby for dispersant application is considered to be limited. | Dedicated standby vessels and aircraft has substantial costs, that would be incurred for the duration of the activity. | **Reject**: These controls have high costs that are disproportionate to the potential environmental benefit that might be gained. |
| | | Dedicated FWADC air tractor on standby at Exmouth. | On standby 24/7 during operations to expedite initiation of aerial dispersant application. | Large | 1 | 0-1 | Major $312K/yr includes ground support | H | H | H | H | L no SIMOPS with aerial applic'n | | Negative sacrifice versus benefit gained when viewed in context of having the existing service available through AMOSC / AMSA and given the short response time for mobilisation to site of the AT802 air tractors from the WA base in Perth, i.e., <12 hours, which allows for vessel and aerial dispersant application to commence on Day 1, i.e., within the first 24 hours of a loss of containment. | |
| | | Dedicated Hercules C130 on standby at Exmouth. | On standby 24/7 during operations to expedite initiation of aerial dispersant application. | Large | 1 | 0-1 | Major | H | H | H | H | L | | | |

**Response Preparedness Performance Standards – Chemical Dispersant Application**

| Spill Response Preparedness – Chemical Dispersant Application | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| APPEA Memorandum of Understanding: Mutual Aid | BHP shall be a signatory to the APPEA Memorandum of Understanding: Mutual Aid to enable access to industry resource including vessel dispersant spray systems, dispersant stockpiles, and trained personnel | APPEA MoU in place | APU Operations Manager |
| Service Level Agreement | BHP shall have a contract in place with OSROs to facilitate access to:<br>• Regional and global dispersant stockpiles;<br>• FWAD (including Hercules C130) capability includes provision of ground crew and air attack supervisors;<br>• SSDI equipment (via SFRT / SIRT); and<br>• SSDI monitoring equipment and personnel | Service Level Agreement | APU Operations Manager |
| | BHP shall maintain a contract with a NATA accredited laboratory to undertake dispersant efficacy testing | Service Level Agreement | BHP Lead Principal HSE |
| Application equipment (spray system) | BHP shall maintain both a primary and secondary oil spill dispersant spray system for ready field deployment as required. | Spray system inventory | APU Operations Manager |
| Monitoring of vessel availability & status | BHP shall maintain the Global Contractor Management System (GCMS) to monitor regionally available OSV on a monthly basis during the activity. | Vessel monitoring / availability records | APU Operations Manager |
| Response Timing | BHP shall maintain arrangements to facilitate the mobilisation of chemical dispersant operations in accordance with the timeframes detailed in Table 7-3. | Exercise records | APU Operations Manager |

**Demonstration of Acceptability – Chemical Dispersant Application**

- A detailed ALARP evaluation has been undertaken including an assessment of alternate and improved options and BHP has adopted an approach to undertake chemical dispersant application in the shortest reasonably practical timeframes;
- There is sufficient stockpiles of dispersant to meet the requirements for responding to a WCD of crude from the Pyrenees Field;
- BHP’s approach to the acceptance for use of chemical dispersant aligns with the NatPlan;
- BHP’s Dispersant Application Zone includes provision to seek approval from Jurisdictional Authorities prior to application as required; and
- Given the multiple spill response preparedness measures detailed within this section, BHP consider the Environmental Performance Outcome of ‘BHP prepared to respond to a potential WCD scenario in an effective and timely manner’ will be achieved.

### 7.2.10 Marine Recovery (RS4)

**Summary of Activity – Marine Recovery (Tier 2 – Tier 3)**

The basis of assessment for marine recovery relates to the instantaneous area ($km^2$) with floating oil >50 $g/m^2$ (>50 µm) (Table 4-2). For an LOWC event, this equates to 150 $km^2$ (Figure 4-1 and Figure 4-2). However, given the potential reduction in surface hydrocarbons via the implementation of a combined response strategy including source control and SDA (refer Section 6.3.4), the overall area ($km^2$) with floating oil >50 $g/m^2$ (>50 µm) potentially suitable for marine recovery is expected to reduce from the theoretical 150 $km^2$.

The Strategic SIMA (refer Section 5.1.1) for crude determined that marine recovery and surface dispersant application would both have positive effect for majority of values and sensitivities in WA and Commonwealth waters.

The Marine Recovery response strategy involves the deployment of a booming system by vessels to gather and contain surface oil, while a skimmer is used to retrieve the oil slick from the sea surface and decant it to suitable storage such as barges or internal tanks on vessels. The use of booms can assist with minimising the potential impact by reducing the amount of surface oil thereby preventing it from reaching environmentally sensitive shorelines. Marine Recovery is not suitable for diesel slicks as diesel rapidly spreads and has a high evaporation rate in the first 24 hours. Marine Recovery is not considered to be a primary method for reducing impacts from Level 3 spills, but rather as secondary response strategy that may be applied under favourable environmental conditions at targeted locations. This strategy is highly dependent on weather conditions and sea state, hydrocarbon characteristics and boom type. Marine Recovery requires vessels (typically two per boom), booming and skimming equipment, suitable containment for retrieved oily waste and trained operators/ personnel.

Cone of response associated with on-water response strategies for a crude spill would typically involve a combination of the following:

- Monitoring and Evaluation;
- Surface Dispersant Application (SDA) via fixed wing aerial dispersant (FWAD) and vessel; and
- Marine Recovery.

The exact arrangement/combination of response strategies would be selected based on the spill scenario, state of weathering of the oil, weather forecast and best available combination of vessels/aircraft and equipment.

**Potential Environmental Impacts and Risks – Marine Recovery**

Potential environmental impacts and risks associated with a marine recovery response in offshore waters are consistent with those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for 'Offshore Response Operations'.

Potential environmental impacts and risks associated with nearshore marine recovery and mitigative control measures are summarised in Section 8.2 for 'Nearshore Response Operations'.

Additionally, there are potential impacts and risks associated with the disposal of the recovered waste crude oil and the cleaning and/ or disposal of boom equipment as well as potential risk of entanglement of marine fauna within the booms or accidental corralling fauna into surface oil.

**Oil Spill Budget – Marine Recovery**

Sea state of Beaufort 1-4 is optimal (IPIECA-IOGP, 2015a), with the operation targeting Bonn Code 4/5 oil (>100 g/m$^2$).

Fixed boom systems (e.g., magnetic brackets and short length of boom attached to a leaking vessel) would not be a practicable option in Commonwealth waters. It would be extremely challenging to anchor/hold the boom in a suitable configuration due to the water depth (without many vessels holding a single boom in position) and combined with strong currents in NW Australia, a boom fixed to a leaking vessel would not be expected to capture any significant volume of recoverable oil, as oil is likely to flush under the boom due to current speeds.

A minimum single offshore marine recovery operation would require a large AHTS vessel, or other similar large vessels with a rolled stern, able to deploy offshore boom from the back deck. The capability would also require deployment of suitable skimmers and some form of liquid oily waste storage capacity (e.g., inboard or deck tanks). For a single vessel operation, a boom-vane system would be required to maintain the booms configuration. If no boom-vane system was available, a second vessel (possibly slightly smaller) to tow the leading edge of the boom would also be required.

Alternatively, an advanced booming system (e.g., speed-sweep or current buster system), typically requiring 3-5 vessels could be used, which would be better for recovery of more fragmented spills, as the system can operate at higher speeds.

Regardless of the technique (traditional versus advanced) the encounter rates will vary significantly, depending on the oil behaviour. For example, far higher encounter rate will occur if the oil is in very thick patches compared to if the oil has become spread-out into windrows. Chasing patches/windrows is very time consuming, due to slow vessel speeds (typically 1 knot over water for traditional, or 4 knots with advanced booming techniques).

Theoretical calculations of encounter rates for contiguous oil have been provided in Section 6.3.5. However, there is potential for significant variability in encounter and recovery rates, due to variations in oil types, variation in the weathering of different products in the environment over time, changing wind and current speed and direction, all contributing to the oil spill budget calculation results being of limited accuracy.

Therefore, attempting to calculate or quantitatively define a maximum field capability statement is extremely challenging for this response strategy.

In order to achieve any significant volume of oil recovery, a theoretical maximum field capability for offshore marine recovery could be viewed as a Tier 2 capability (refer Table 6-5), such as three to five traditional strike teams, or 1-2 advanced booming strike teams (~10 vessels plus equipment).

**Response Arrangements – Marine Recovery**

**Procedure and Guidance**

APU Oil Spill Response Strategy – RS4 Marine Recovery (AOHSE-ER-0056)

Containment and Recovery Field Guide (Oil Spill Response, 2011)

Standard Operating Procedure: Booms – Offshore RO-BOOM / Lamor HD boom (AMOSC, 2014)

**Equipment**

BHP have two complete marine recovery units available for deployment.

As a member company, BHP has access to additional industry equipment maintained by AMOSC (Appendix A – Industry Response Equipment).

Under an existing Service Level Agreement, BHP has access to OSRL equipment (Appendix A – Industry Response Equipment).

AMSA also maintain advancing booming systems regionally in Darwin, Broome, Karratha, and Fremantle, with additional units in other National Plan stockpiles. This equipment is accessible under National Plan arrangements, should it be required.

Current AMOSC/AMSA/MoU equipment stockpiles for offshore boom and skimmers would enable the set-up of 8 operational units in total.

Offshore marine recovery typically involves vessels, offshore booms, skimmers, and offshore liquid oily waste storage. Preferred vessels for offshore containment and recovery are AHTS vessels with a large open deck and rolled/open stern, for safe deployment of offshore boom.

Vessels of suitable capacity (AHTS, tug or small utility vessels) for this operation are available on spot market in the NWS region. These classes of vessels do not require significant modification before they can be ready for marine recovery operations.

Disposal of recovered oil/water can be taken to existing waste storage facilities in Dampier or to the Pyrenees Facility. To improve the efficiency of the marine recovery strategy, storage of recovered oil/water can utilise the recovery vessel storage tanks, supplemented by IBC's (or iso-containers on larger vessels). Gaps in storage capacity or to reduce transit times can be overcome by either:

- The use of decanting (in accordance with MARPOL requirements and AMSA guidelines). Decanting at the point of collection will limit environmental impact as the water would already be in contact with hydrocarbons and additional oil can be removed from the environment; and
- Establishing temporary storage transfer on barges or other vessels adjacent to recovery operations and using other vessels to transfer collected oil from the transfer location to disposal or processing locations.

**Personnel**

AMOSC staff and AMOSC Core Group are trained in marine recovery operations. The personnel would be supplemented by additional resources as described within Section 7.1.3 'General Support'.

AMOSC Core Group responders experienced in the marine recovery operation may also need to be deployed to other response activities. To enable the expansion of marine recovery operational unit's Core Group personnel or AMOSC contractors/trainers would be used to train marine crews in the use of marine recovery. The estimated duration of the training is half a day prior to the unit being operational.

**Response Timing – Marine Recovery**

It is anticipated that 2x marine units could be operational by day 3, with an additional 6x units deployed by day 8. If deployed onto an AHTS vessel, the equipment can be sea-fastened directly to the deck, and the AHTS vessel can then sail directly to site, and commence boom deployment.

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) | | | | | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | | | |
| **Eliminate** | Negative environmental impact from the execution of this response strategy. | No marine recovery. | Do nothing option. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option; experience from past oil spills suggests that volumes of oil ashore are reduced when marine recovery operations are activated. Removing oil from the surface will assist in effort to reduce the volume of oil making shoreline contact, hence enabling prevention of contact with sensitive environmental receptors. | There may be occasions when marine recovery is not implemented, e.g., during poor weather, or when operations are temporarily ceased such as, for example, due to the presence of migratory EPBC Act Listed species occurring within the area of operations, but in general, the 'do nothing' option is not considered within the external context (e.g., stakeholder views) to be a viable option. | **Reject:** Marine recovery using booms and skimmers is a recognised strategy for the mitigation of oil spill impacts. |
| **Separate** | Response executed when EPBC Act listed migratory are in the area. | Operational control to prevent impacts on EPBC Act Listed migratory species | If EPBC Act Listed migratory species such as humpback whales or whale sharks are observed in the immediate vicinity of marine recovery operations as determined from situational awareness reports from the 'monitor and evaluate' response strategy and/ or from the vessel platforms, marine recovery operations would cease until the animal has moved out of the area and has not been sighted for 30 minutes. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environment benefit gained by reducing the potential impacts, e.g., entrapment, entanglement, associated with implementing marine recovery operations in areas where EPBC Act Listed migratory species have been observed, as determined from situational awareness reports. Operations would cease until the animal has moved out of the area and has not been sighted for 30 minutes to reduce the potential of interaction with booms. | Controls have high effectiveness; are available, functional, and reliable and in general are survivable and compatible with other control measures. Controls have minor cost implications for operations. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | Response use during periods of important windows of ecological sensitivity, e.g., coral spawning; turtle nesting season; migratory shorebirds arriving /departing the region and during migrations of EPBC Act Listed species. | Temporal / seasonal windows of ecological sensitivity to be considered in Operational SIMA. | Marine recovery is a key response strategy to facilitate the protection of sensitive shorelines and adjacent shallow water habitats particularly those occurring within the NMP. However, marine recovery during periods of important windows of ecological sensitivity, e.g., coral spawning; turtle nesting season; and during migrations of EPBC Act Listed species such as whales and whale sharks (as described in Section 4 of the EP; will be a key component of the Operational SIMA and will be subject to operational constraints. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environment benefit gained by reducing the potential impacts associated with marine recovery operations during windows of important ecological sensitivity. For example, boom containment and recovery operations would not be applied in areas with visible coral spawning slicks. | | |
| **Administrate** | Response strategy executed adhoc with no real planning process. | Marine recovery operations reviewed and managed by IMT through Incident Action Plan (IAP) process. | Within the first 24 hours, the BHP IMT will develop IAPs. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/ evaluation of marine recovery operations will take place almost immediately in the event of a Level 3 spill. The marine recovery operations would be adapted based on real-time information regarding the spill incident: determine if sea state and weather conditions are conducive to operations and applicability with other response strategies. | Controls have high effectiveness; are available, functional, and reliable and in general are survivable and compatible with other control measures. Controls have minor cost implications for operations. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | Response activities not considered in preparedness planning therefore not allowing for input into the Operational SIMA. | Operational SIMA to include evaluation of requirement for implementation of marine recovery operations. | The marine recovery response strategy will be activated if Operational SIMA indicates the implementation would provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors. | N/A | N/A | 2 hours from IMT formation | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational SIMA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors.<br><br>Marine recovery will be activated if the Operational SIMA indicates the potential harm of implementation is less than leaving the oil untreated on the surface; and if the implementation of the marine recovery response strategy would provide a net environmental benefit to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors. | | |
| | Poor situational awareness and understanding of oil spill trajectory prior to response execution (i.e., oil could be heading out to sea). | Modelling predictions of oil trajectory to be undertaken to support the Operational SIMA. | Used as tool to gain situational awareness through real-time spill trajectory modelling to enable direction of daily marine recovery operations. | N/A | N/A | 2 hours from IMT formation | Minor | H | H | H | H | H | Positive environmental benefit gained as oil spill trajectory modelling will assist in the effective deployment of marine recovery vessels to areas where sensitive receptors require priority protection. | | |
| | Oil recovered not recorded to allow for effectiveness analysis and Operational SIMA inputs. | Volumes of oil recovered will be recorded. | All recovered oil will be logged and reported to Incident Commander. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by understanding the efficiency of marine recovery operations.<br>Positive environmental benefit gained by implementation of Waste Management Plan. | | |
| | Weather impacting the response operations increasing safety and operational risk. | Marine recovery boom will not be deployed during periods of weather and sea state conditions that are not appropriate for successful marine recovery operations. | Safety considerations for marine crew and reduces potential for inefficient oil spill response operations when weather conditions are not conducive for recovery of oil. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by reducing the potential for inefficient oil spill response operations when weather conditions are not conducive for recovery of oil. | | |

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H): Availability | Effectiveness (L/M/H): Functionality | Effectiveness (L/M/H): Reliability | Effectiveness (L/M/H): Survivability | Effectiveness (L/M/H): Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | Incompetent personnel utilised during response operations. | Trained operators to supervise boom deployment and marine recovery operations. | Use of skilled personnel to supervise Roboom deployment and oil skimming operations will increase efficiency of marine recovery efforts. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by using skilled personnel to supervise Roboom deployment and oil skimming operations to increase efficiency of marine recovery efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation. | | |
| | Response continues with no end point or is removed early. | Response strategy activities continued until termination criteria met. | Ensures that the marine recovery response strategy continues until the performance outcome has been achieved. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from ensuring that the marine recovery response strategy continues until the performance outcome has been achieved. | | |
| **Administrate** | Marine recovery resources (equipment) not available to respond when required. | Access to marine recovery equipment, e.g., Roboom, skimmers, power packs, storage containers owned by AMOSC (in Exmouth, Fremantle, Dampier, and Geelong). | Mobilisation of AMOSC owned marine recovery equipment from Exmouth / Fremantle / Geelong, and BHP stock from Dampier. | Small | AMOSC | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective of marine recovery is to contain the oil on the surface and then recover it using skimming equipment. This reduces the volume of oil that has the potential to make shoreline contact and have negative consequences on sensitive shoreline receptors. | The response capacity is small, but the control effectiveness is generally high (cf. potential for weather downtime). BHP has access to this capability through contractual arrangements with AMOSC / OSRL. Control has minor cost implications for operations. | <u>**Accept**</u>: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Marine recovery resources (equipment) not available to respond when required. | Access to marine recovery equipment, e.g., Roboom, skimmers, power packs, storage containers owned by OSRL. | Mobilisation of OSRL marine recovery from Singapore and other countries. | Small | OSRL | < 24 hours to mobilise; onsite > 7 days | Minor | Low (due to time to mobilise) | H | H | H | H | | | |
| | Marine resources (vessels) not available to respond when required. | Access to support vessels (Pyrenees Facility, support vessel, Mutual Aid, local charter). | BHP Marine Fleet, Mutual Aid MoU's, and vessels of opportunity available on the local spot charter market in Exmouth. | Small | 2+ | 0-1 | Minor | H | H | H | H | H | The environmental benefit associated with marine recovery is potentially significant, which has the potential to reduce the environmental severity of the spill | The response capacity is small for vessel operations, but the control effectiveness is generally high (vessel operations are only possible during daylight hours, and SIMOPS in the same area with aerial operations is not possible) and the cost of using all available BHP marine vessels, those available through Mutual Aid | <u>**Accept**</u>: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Marine resources (vessels) not available to respond when required. | | Vessels already on contract or readily obtained through MoU's, no additional standby cost. | | | | | | | | | | | | |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | | | | | | | and on the local spot-charter market in Exmouth / Dampier / Broome has minor cost implications. Cost during activation would be moderate. | |
| **Administrate** | Marine resources (vessels) not available to respond when required. | Support vessels (Australia, SE Asia). | Acquisition of more support vessels via charter on the spot-market from around Australia and/or SE Asia. | Medium | As required | 3-8 | Moderate | H | H | H | H | H | Marine recovery units on standby during event – Scaling up a fleet of vessels/equipment during an event to be on standby during the response would enable increased collection of surface hydrocarbons. These vessels could then be deployed to areas where hydrocarbons are amenable to collection or if high shoreline sensitivities are predicted to be impacted. These vessels may work at a low efficiency rate (<35 $m^3$/day). Although the environmental benefit is low compared to the overall spill volume, a higher environmental benefit may be obtained by reducing hydrocarbons impacting shorelines.<br><br>The environmental benefit associated with marine recovery is considered to be significant, which has the potential to reduce the environmental severity of the spill. | The response capacity is small for vessel operations, but the control effectiveness is generally high (vessel operations are only possible during daylight hours, and SIMOPS in the same area with aerial operations is not possible) and the cost of using marine vessels available as required through the spot-charter market around Australia and SE Asia has minor cost implications.<br><br>The costs of having the vessels and equipment on standby during an event are moderate and acceptable to BHP and therefore this will be implemented during a Level 3 response. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Marine recovery resources (equipment) not available to respond when required. | Obtain and locate additional marine recovery equipment. | Acquisition of more marine recovery equipment to be on standby during the campaign. | Medium | As required | 3-8 | Moderate | H | H | H | H | H | Scalable options for marine recovery operations involve accessing more vessels from around Australia and the broader region including SE Asia. | Suitable stockpiles of marine recovery resources (equipment) exist within AMOSC and AMSA inventory. | |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (Days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | Marine recovery resources (equipment) not available to respond when required. | Dedicated marine recovery vessels with recovery equipment (e.g., Roboom, skimmers, etc.) on standby in field or Dampier Supply Base. | On standby 24/7 during operations to expedite initiation of marine recovery operations. | Small | As required | 0-1 | Major $35K/day x 120 days = > $4.2M | H | H | L | H | H | The environmental benefit associated with a dedicated marine recovery vessels on standby is considered to be significant, which has the potential to reduce the environmental severity of the spill.<br>Scalable options for marine recovery operations involve having dedicated vessels on standby with marine recovery equipment onboard in the unlikely event of a hydrocarbon spill. Having 4 vessels on standby in Exmouth and J-boom/skimmers located at site for the initial response may enable an extra 2 days of marine operations (if conditions were favourable). This would collect additional 100 $m^3$ oil which is low in terms of the overall oil budget that may reach shore.<br>Improved reliability in open ocean recovery – Expanding the stockpile of the NOFI current buster type of boom would increase operational window for marine recovery activities. Single unit costs in the order of $600K and units could be sourced from the supplier during the spill event. Each unit would increase the daily recovery rate by 50 $m^3$ which is low in terms of the overall oil budget that may reach shore. | Dedicated standby vessels/equipment have substantial costs, during operations. | **Reject**: These controls have high costs that are disproportionate to the potential environmental benefit that might be gained particularly taking into consideration the small increment of oil volume that would be recovered prior to activation of the IMT response, which would occur on a time scale of 1-3 days. |
| | Insufficient number of trained personnel. | Additional number of trained marine recovery specialists. | Additional number of marine crew trained in the use of the equipment prior to mobilisation. | Small | As required | 0-1 | Moderate, includes standby crew | H | H | L | H | H | Training of marine crews in the use of the equipment can be done prior to mobilisation to the field in half a day with a small complement of AMOSC or OSRL specialists. This could be included in the mobilisation schedule given the likelihood of weather downtime in the use of this oil response strategy. | Providing training prior to the event, surplus to the existing trained AMOSC Core Group etc, has limited benefit as the training on site/on the job would not significantly impact (<4 hrs) the timeframe to operation of marine recovery. Controls have disproportionate cost/effort relative to environmental benefit gain. | **Reject**: These controls have costs/ effort sacrifice that are disproportionate to the potential environmental benefit that might be gained particularly taking into consideration the short timeframe for training (<4 hrs). |

**Response Preparedness Performance Standards – Marine Recovery**

| Spill Response Preparedness – Marine Recovery | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| APPEA Memorandum of Understanding: Mutual Aid | BHP shall be a signatory to the APPEA Memorandum of Understanding: Mutual Aid to enable access to industry resource. | APPEA MoU | APU Operations Manager |
| Service Contract | BHP shall maintain a contract for a minimum of 2x AHTS vessels to support the Pyrenees Phase 4 Infill Drilling Program. These vessels may be called upon to undertaken marine recovery operations. | Service Level Agreement | Head of Drilling & Completions - Australia |
| | BHP shall have a contract in place with OSROs (AMOSC and OSRL) to facilitate access to industry containment and recovery equipment and trained response personnel. | Service Level Agreement | APU Operations Manager |
| Monitoring of vessel availability & status | BHP shall maintain the Global Contractor Management System (GCMS) to monitor regionally available OSV on a monthly basis during the activity. | Vessel monitoring / availability records | APU Operations Manager |
| Response Timing | BHP shall maintain arrangements to facilitate initial marine recovery operations in within 24 hours | Exercise records | APU Operations Manager |

**Demonstration of Acceptability – Marine Recovery**

- A detailed ALARP evaluation has been undertaken including an assessment of alternate and improved options and BHP has adopted an approach to undertake marine recovery in the shortest reasonably practical timeframes; and
- Given the multiple spill response preparedness measures detailed within this section, BHP consider the Environmental Performance Outcome of 'BHP prepared to respond to a potential WCD scenario in an effective and timely manner' will be achieved.

### 7.2.11 Shoreline Protection (RS5)

**Summary of Activity – Shoreline Protection (Tier 2)**

The basis of assessment for shoreline protection relates highest accumulated shoreline loading above moderate threshold (100 g/m$^2$) and the longest length (km) of shoreline oiled >100 g/m$^2$ (Table 4-2). For an LOWC event, shoreline loading has been modelled up to 18,370 tonnes across all shorelines and up to 10,797 tonnes at the Ningaloo Region (Figure 4-1 and Figure 4-2).

However, by BHP initiating a combined response strategy and assuming the successful deployment of the CSS within defined timeframes, the oil spill budget presented within Section 6.3.4 (Source Control + SSDI + SDA) the peak load across all shorelines potentially reduce to between 28% to 47% compared with the unmitigated peak load. Whilst peak load across all shorelines may be reduced significantly via a combined response, the total peak load at the Ningaloo Region was substantially reduced primarily via SDA (~3,000 tonnes), therefore the basis of shoreline protection response strategy shall be focussed on peak loading at Ningaloo Region assuming the implementation of SDA.

Another consideration for shoreline protection operations is the minimum arrival time above a moderate threshold (100 g/m$^2$). Spill modelling indicates for a LOWC scenario, a minimum arrival time of 0.9 days at Muiron Islands and 2.6 days at Onslow Region with arrival at other receptors after 2.6 days (Table 4-3) and for an MDO release a minimum arrival time of 0.7 days at Ningaloo Region (Table 4-4). Whilst minimum arrival times may be less than 24 hours at some locations, potential shoreline exposure is cumulative rather than instantaneous, therefore shoreline protection measures would be designed to avoid potential peak loading rather than full prevention of shoreline contact.

Shoreline protection will be carried out as directed by the Western Australian Department of Transport (WA DoT), as the Controlling Agency in State waters.

Shoreline protection involves the deployment of protection and deflection booms which assist in minimising the amount of oil contacting shorelines. At the direction of WA DoT, protective and deflective booms may be deployed to deflect a slick away from an identified sensitivity towards an area where collection can be more effective without impacting high value habitat areas. Alternatively, slicks can be deflected to shorelines of lower environmental value where the oil can be collected, or if appropriate, identification of nearby suitable sacrificial habitat.

This response strategy involves the deployment of vessels, equipment and personnel and is dependent on favourable weather and sea state conditions.

It should be noted that shoreline protection and shoreline clean-up measures for Barrow Island are established and maintained by Chevron. Chevron's Oil Pollution Emergency Plan arrangements would be enacted following joint consultation with Chevron and the WA DoT. The need for activation would be identified during the implementation of RS2 Monitor and Evaluate. Should data indicate potential shoreline contact with Barrow Island or any nearby receptors, Chevron would be notified and mobilised via existing arrangements by the WA DoT as the Controlling Agency.

**Potential Environmental Impacts and Risks – Shoreline Protection**

Potential environmental impacts and risks associated with shoreline clean up and mitigative control measures are summarised in Section 8.28.2 'Nearshore Response Operations', and Section 8.3 for 'Shoreline Response Operations'.

The installation of booms and associated equipment could result in damage to sensitive habitats and disturbance of fauna (e.g. trampling of mangroves, emergent reefs, turtle nesting beaches; and damage to emergent reefs by vessels used to deploy nearshore booms and anchoring impacts), entanglement of marine fauna within booms, accidental corralling fauna into surface oil, accidental deflection of surface oil to sensitive shorelines and environmental receptors, and damage to Aboriginal registered sites of cultural significance from shoreline accumulation and deployment of protection and deflection booms.

The environmental sensitivity of shorelines that may be impacted by hydrocarbon exposure is a key consideration in determining priorities for shoreline response (refer Section 8.3 for further detail). The sensitivity of shorelines may vary depending on the time of year, as some shorelines in the region are used as turtle and bird nesting areas.

Physical presence and movement of personnel across turtle nesting beaches could potentially cause damage to buried turtle eggs, reducing turtle nesting success. Artificial light is known to disorientate marine turtles, particularly hatchlings and female adults returning to the sea from nesting areas on the shore (Pendoley, 2005). Incorrect management of personnel and equipment on turtle nesting beaches could result in a minor impact on a small proportion of a turtle nesting population.

Sensitive receptor protection (intertidal booms and skimming) and shoreline clean-up responses (see Section 7.2.12) may generate a significant quantity of hydrocarbon contaminated solid and liquid waste. Contaminated solids would include PPE, spill clean-up equipment (shovels, rakes, etc.) and the oil contaminated sediments collected from shorelines (IPIECA, 2015) and oil-coated booms, skimmers etc. and the oily contaminated liquids and sediments collected during the nearshore booming/skimming activities. Inappropriate management of oil contaminated waste could result in localised secondary contamination of the nearshore marine environment shoreline sediments and harm to individuals of protected species.

**Oil Spill Budget – Shoreline Protection**

As detailed in Section 6.3.7 ‘Protection of Sensitive Resources’ there is no defined minimum thickness for effective protection and deflection operations and booming at low surface thresholds may still result in a positive environmental outcome, by preventing accumulation over time.

Based upon pre-determined sensitive locations (see Tactical Response Plan (TRP) locations in the following section) and consultation with the WA DoT, both the Muiron Islands and the Ningaloo coast would be likely protection priorities to implement shoreline protection operations.

**Response Arrangements – Shoreline Protection**

As directed by WA DoT, BHP will arrange for the call-up of the necessary personnel and logistics associated with maintaining response crews at the impact location, which includes the support arrangements to ensure the health, safety, and welfare of the shoreline crews. This includes availability of PPE, sun shelter, first aid supplies, catering, drinking water, ablutions, decontamination facilities, accommodation, transport, and communications to support the number of personnel expected to be required at the impact location.

**Procedures / Guidelines**

APU Oil Spill Response Strategy – RS5 Shoreline Protection (AOHSE-ER-0057)

Tactical Response Plans (TRPs)*:

- Yardie Creek (AOHSE-ER-0068)
- Mangrove Bay (AOHSE-ER-0065)

* Of the 5x regional TRPs developed, these particular locations were identified as suitable for shoreline protection with feasibility of implementing functional shoreline protection considered high.

**Personnel**

As described in Section 7.1.3 'General Support', BHP would initiate the deployment of labour-hire personnel to staff shoreline protection crews in addition to BHP personnel. In consultation with WA DoT, BHP has committed to initially engaging between 200-700 labour-hire personnel and engage additional personnel as required at the direction of WA DoT. All personnel would receive relevant on-the-job training prior to undertaking shoreline protection operations.

**Equipment**

In consultation with WA DoT, BHP has committed to deploying regionally available industry protection and deflection equipment to the 5x TRP locations in the first instance, at the direction of WA DoT.

As a member company, BHP has access to industry equipment maintained by AMOSC (Appendix A – Industry Response Equipment).

Under an existing Service Level Agreement, BHP has access to OSRL equipment (Appendix A – Industry Response Equipment).

BHP has ready access to regionally available equipment such as PPE, shelter, accommodation units, vehicles, and machinery.

**Response Timing – Shoreline Protection**

In consultation with the WA DoT, BHP has committed to:

- mobilise initial (first strike) crews (including AMOSC Core Group members) to priority protection areas (as determined by WA DoT) within 48 hours of a spill event with the potential to impact State lands.
- initiating the deployment of regionally available industry shoreline protection and deflection equipment (detailed within Appendix A – Industry Response Equipment) within 24 hours of a spill event with the potential to impact State lands; and
- making sufficient resources available and establish a minimum of 5x forward operating bases at priority protection areas in the N.W. Region of Western Australia (including the Ningaloo / Exmouth Region) (as determined by the WA DoT) within 96 hours of a Level 2 / Level 3 spill event occurring.

Supplementary resources (personnel and equipment) will continue to be deployed by BHP under the direction of the WA DoT until peak capacity is reached as deemed appropriate by WA DoT.

BHP shall maintain resourcing at levels determined by the WA DoT until termination of the response strategy.

**Legislative and Other Considerations – Shoreline Protection**

Shoreline protection operations are administered by WA DoT as the Controlling Agency within State jurisdiction.

BHP via the Joint Strategic Coordination Committee (JSCC) (as described within the *APU IMT Capability Assessment Report* (AOHSE-ER-0071) would engage with other relevant Western Australian State

Departments such as the Western Australian Police Force, Department of Planning, Lands and Heritage, and the Department of Health in relation to emergency response arrangements in State jurisdiction.

Several Conservation Management Plans identify marine debris as a key threatening process to recovery. Also, the relevant action from the Threat Abatement Plan for the impacts of marine debris on vertebrate marine life (DEWHA, 2009) is to "contribute to the long-term prevention of the incidence of harmful marine debris". The prevention of garbage entering the marine environment and the appropriate management of sewage and food wastes reduces the risk of impacts to the marine environment and demonstrates alignment with the various Conservation Management Plans and Threat Abatement Plans.

For nearshore vessel operations: Marine Order 91 (Pollution Prevention – Oil), Marine Order 94 (Pollution Prevention – Packaged Harmful Substances), Marine Order 95 (Pollution Prevention – Garbage) and Marine Order 96 (Pollution Prevention – Sewage) and EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with Cetaceans (modified to include whale sharks and turtles).

The Threat Abatement Plan to reduce the impacts of exotic rodents on biodiversity on Australian offshore islands of less than 100,000 hectares (DEWHA, 2009), describes the threat of invasion or reinvasion of rodents on bird populations. The relevant action from DEWHA (2009) is to prevent invasion or reinvasion via prevention / risk reduction for rodents gaining access to key vessels at key ports. BHP's controls align with the intent of preventing invasion/establishment of pests.

The Recovery Plan for Marine Turtles in Australia (DoEE, 2017) identifies that light pollution and vehicle damage (and therefore possibly excessive foot traffic) are possible threats to turtle nesting, which could result from shoreline response activities during an oil spill response. Controls which align with the intent of the Recovery Plan have been adopted, including consideration of the National Light Pollution Guidelines (DoEE, 2020).

*Logistical Constraints*

Multiple use of logistics contractor to support other operations: The initiation of multiple response strategies in Exmouth has the potential to cause conflicts on the available logistic contractors' movement of equipment required for the first strike shoreline protection. The equipment required to deploy shoreline protection can be delivered to the location by either the logistics contractors or the first strike teams themselves with the use of utility vehicles and trailers if trucks were deployed for other strategies (i.e., moving dispersant stocks). It has been assessed that this would not be a conflict to the required deployment timeframe.

Access to areas requiring shoreline protection: There is access to coastline from Exmouth through to Yardie Creek using paved roads with access tracks to most beaches. From Yardie Creek to Coral Bay, and the Eastern Coastline of the Exmouth Gulf to Onslow, there is limited 4WD access. Vehicles for managing the logistics in these areas would be required such as 4WD buses and trucks. Transit times would expect to be longer. Access to the nearshore islands would be via barge or small vessel.

Locations amenable to shoreline protection: Whilst developing Tactical Response Plans for shoreline protection and clean-up, AMOSC identified that many areas on the N.W. coast were not suited to shoreline protection given:

- The reliability of deployment effectiveness of shoreline protection equipment at the locations exposed directly to the Indian Ocean or high currents in the inner reef area is limited;
- The exposed coastline at Jurabi, Turquoise Bay and the Muiron islands are not suitable for shoreline protection methods. Shoreline booming would be suitable at times for enhanced collection, but this was determined to be short-lived between tides.
- During the response, SCAT teams and specialists will continue to monitor opportunities to deploy additional shoreline protection strategies above and beyond what is described in the Tactical Response Plans.

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from the execution of this response strategy. | No shoreline response. | Do nothing option. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option; experience from past oil spills suggests that environmental sensitivities can be protected effectively when shoreline protection operations are activated. | There may be occasions when shoreline protection is not implemented, e.g., during poor weather, or when operations are temporarily ceased such as, for example, due to the presence of migratory EPBC listed species occurring within the area of operations, but in general, the 'do nothing' option is not considered within the external context (e.g., stakeholder views) to be a viable option. | **Reject**: Shoreline protection using booms is a recognised strategy for the mitigation of oil spill impacts |
| **Separate** | Response executed when EPBC Act listed migratory are in the area. | Operational control to prevent impacts on EPBC Act Listed migratory species. | If EPBC Act Listed migratory species such as humpback whales or whale sharks are observed in the immediate vicinity of shoreline protection operations as determined from situational awareness reports from the 'monitor and evaluate' response strategy and/or from the vessel platforms, shoreline protection operations would cease until the animal has moved out of the area and has not been sighted for 30 minutes. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environment benefit gained by reducing the potential impacts, e.g., entrapment, entanglement, associated with implementing shoreline protection operations in areas where EPBC Act Listed threatened/migratory species have been observed, as determined from situational awareness reports. Operations would cease until the animal has moved out of the area and has not been sighted for 30 minutes to reduce the potential of interaction with booms. | Controls have high effectiveness; are available, functional, and reliable and in general are survivable and compatible with other control measures. Controls have minor cost implications for operations. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | Response use during periods of important windows of ecological sensitivity, e.g., coral spawning; turtle nesting season; migratory shorebirds arriving /departing the region and during migrations of EPBC Act Listed species. | Temporal / seasonal windows of ecological sensitivity to be considered in Operational SIMA. | Shoreline protection is a key response strategy to facilitate the protection of sensitive shorelines and adjacent shallow water habitats particularly those occurring within the NMP. However, shoreline protection during periods of important windows of ecological sensitivity, e.g., coral spawning; turtle nesting season; and during migrations of EPBC Act Listed species such as whales and whale sharks will be a key component of the Operational SIMA and will be subject to operational constraints. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environment benefit gained by reducing the potential impacts associated with shoreline protection operations during windows of important ecological sensitivity. For example, shoreline protection operations would not be applied in areas with visible coral spawning slicks. | | |
| | Response strategy not executed effectively through planning or fast enough to prevent impact highly sensitive areas impacted. | Pre-deployment of shoreline protection boom at identified sensitivities along the Ningaloo Coast during operations. | Pre-deployment of shoreline protection boom at identified sensitivities along the Ningaloo Coast would reduce the time to deployment following the loss of hydrocarbons thereby increasing the potential for protection of environmental sensitivities. | N/A | N/A | N/A | Major; 2 people $1,000 / day x 120 days = $120K | H | H | H | Low | H | Positive environment benefit gained by pre-deploying shoreline protection boom such as beach guardian at identified sensitivities along the Ningaloo Coast, and Thevenard and Muiron Islands during operations. | This control would have low survivability and major costs associated with standby rates for the field crew to monitor the condition of the boom. | **Reject**: Pre-deployment of shoreline boom has high costs that are disproportionate to the potential environmental benefit that might be gained particularly taking into consideration that sufficient booms are located in Exmouth and mobilisation timeframes are considered to be acceptable for rapid deployment. |

PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Administrate** | Response strategy not executed effectively through planning or fast enough to prevent impact highly sensitive areas impacted. | Shoreline protection operations to be reviewed and managed by IMT through Incident Action Plan (IAP) process. | Within the first 24 hours, the BHP IMT will develop IAPs. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of shoreline protection operations will take place almost immediately in the event of a Level 3 spill. The shoreline protection operations would be adapted based on real-time information regarding the spill incident: determine if sea state and weather conditions are conducive to operations and applicability with other response strategies. | Controls have high effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for operations. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |
| | Response activities not considered in preparedness planning therefore not allowing for input into the Operational SIMA. | Operational SIMA to include evaluation of requirement for implementation of shoreline protection operations. | The shoreline protection response strategy will be activated if Operational SIMA indicates the implementation would provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors. | N/A | N/A | <2 hours from IMT forming | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational SIMA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors.<br><br>Shoreline protection will be activated if the Operational SIMA indicates the potential harm of implementation is less than leaving the oil untreated on the surface; and if the implementation of the response strategy would provide a net environmental benefit to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors. | | |
| | Predictive spill trajectory unknown when undertaking Operational SIMA. | Oil spill modelling contract in place to provide predictions of dispersed crude oil trajectory to be undertaken to support the Operational SIMA and activated within 2 hours of notification. | Used as tool to gain situational awareness through real-time spill trajectory modelling to enable direction of daily shoreline protection operations. | N/A | N/A | <2 hours from IMT forming | Minor | H | H | H | H | H | Positive environmental benefit gained as oil spill trajectory modelling will assist in the effective deployment of shoreline protection boom to areas where sensitive receptors require priority protection. | | |
| | Incompetent personnel utilised during response operations. | Trained operators to supervise boom deployment and shoreline protection operations. | Use of skilled personnel to supervise boom deployment and shoreline protection operations will increase efficiency of oil | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by using skilled personnel to supervise boom deployment and shoreline protection operations to increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes | | |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) | | | | | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | | | |
| | | | spill protection efforts. | | | | | | | | | | are made that magnify the severity of the situation. | | |
| | Shoreline response delayed due to poor understanding of impact area and specific operational response. | Deployment of boom and any laydown areas will follow pre-designated plans for establishing a works area, as described in North West Cape Sensitivity Mapping (AOHSE-ER-0036), to protect environmental sensitivities and including areas of cultural sensitivity. | Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental and cultural sensitivity. | N/A | N/A | N/A | Minor | H | H | H | H | H | | | |
| | Vessel selection limits the ability to deploy boom. | Vessels used to deploy boom will be flat-bottomed (where safe and practicable) and no anchoring of vessels or booms will occur on emergent reefs or other fragile / sensitive benthic habitats. | Increases the potential that impacts to sensitive receptors will be prevented by using plant and equipment that is fit-for-purpose. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by using small marine craft that are fit for purpose in working in shallow water and not anchoring on emergent coral reefs or other sensitive benthic habitats. | | |
| | Response impact (positive or negative) is not known or measured. | Environmental monitoring (refer to Section 7.2.14). | Environmental monitoring to evaluate the concentration of hydrocarbons; the effectiveness of shoreline protection; and the impact of hydrocarbons on marine and shoreline habitats. | N/A | N/A | Immediately and on-going | Minor | H | H | H | H | H | Positive environmental benefit gained from adopting this control measure. Allows evaluation of the effectiveness of shoreline protection techniques. | | |
| | Response continues with no end point or is removed early. | Response strategy activities continued until termination criteria met. | Ensures that the shoreline response strategy continues until the performance outcome has been achieved. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from ensuring that the shoreline protection response strategy continues until the performance outcome has been achieved. | | |
| **Administrate** | Response resources not available. | Access to shoreline protection | Mobilisation of AMOSC owned shoreline | Small | AMOSC | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective of shoreline | The response capacity is small, but the control | **Accept**: Controls are practicable, and the cost sacrifice is |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | equipment, e.g., beach guardian, fence boom, deployment kits, owned by AMOSC (in Exmouth, Fremantle, Dampier, and Geelong). | protection equipment from Exmouth / Fremantle / Geelong, and BHP stock from Dampier. | | | | | | | | | | protection is to separate the oil from shoreline sensitivities. | effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC / OSRL. Control has minor cost implications for operations. | not grossly disproportionate to the environmental benefit gained. |
| | Shoreline response delayed due to poor understanding of impact area and specific operational response. | Shoreline tactical response plans for key sensitivities. | These plans outline the equipment and resources requirements for pre impact and post impact response. | N/A | N/A | 0-1 | Minor | H | H | H | H | H | | | |
| | Response resources not available. | Access to shoreline protection equipment. | Mobilisation of OSRL shoreline protection equipment from Singapore and other countries. | Small | OSRL | < 24 hours to mobilise; onsite > 7 days | Minor | Low (due to time to mobilise) | H | H | H | H | These plans outline the equipment and resources requirements for pre impact and post impact response. Reduces time for response personnel to determine site requirements. | This control has high effectiveness; are available, functional, and reliable and in general are survivable and compatible with other control measures. Control has minor cost implications for operations. | **<u>Accept</u>**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Response resources not available. | Access to small support vessels (AMOSC, local charter). | Mobilisation of AMOSC owned small craft from Geelong and / or vessels of opportunity available on the local spot charter market in Exmouth. | Small | 4 | 7 | Minor | H | H | H | H | H | The environmental benefit associated with shoreline protection is potentially significant, which has the potential to reduce the severity of environmental impact. | The response capacity is small for vessel operations, but the control effectiveness is generally high (vessel operations are only possible during daylight hours) and the cost of using marine vessels available through AMOSC and on the local spot-charter market in Exmouth / Dampier / Broome has minor cost implications. | **<u>Accept</u>**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| **Administrate** | Response resources not available. | Support vessels (Perth / Australia). | Acquisition of more support vessels via charter on the spot-market from Perth and around Australia. | Small | As required | 3-8 | Moderate | H | H | H | H | H | The environmental benefit associated with shoreline protection is considered to be significant, which has the potential to reduce the severity of environmental impact. | The response capacity is small, but the control effectiveness is generally high and the cost of acquiring small marine vessels and more equipment as required through the spot-charter market around Australia and SE Asia has minor cost implications. | **<u>Accept</u>**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | | | | | | | Cost during activation would be moderate. | |
| | Response resources not available. | Additional marine shoreline protection equipment. | Acquisition of more shoreline protection equipment to be on standby. | Small | As required | < 24 hours to mobilise; onsite > 7 days | Minor | Low (due to time to mobilise) | H | H | H | H | Scalable options involve accessing more vessels and equipment from around Australia and the broader region including SE Asia. | Stockpiles of boom are sufficient to meets the needs of the initial areas at risk and current stockpiles held by AMOSC, AMSA, Mutual Aid and supplemented by OSRL international stocks can be mobilised prior to the need for areas that may be impacted in weeks 3 onwards where SCAT teams identify that these locations are amenable to protection. | |
| | Response resources not available. | Dedicated shoreline protection vessel with boom deployment equipment on standby at Exmouth/ Dampier Supply base. | On standby 24/7 during operations to expedite initiation of shoreline protection operations. | Small | 1 | 0-1 | Major $35K/day x 14 days = $500K | H | H | L | H | H | The environmental benefit associated with shoreline protection is considered to be significant, which has the potential to reduce the severity of environmental impact. | Dedicated standby vessels have substantial costs, in the order of $500K during operations. | **Reject**: These controls have high costs that are disproportionate to the potential environmental benefit that might be gained particularly taking into consideration the small increment of oil volume that would be recovered prior to activation of the IMT response, which would occur on a time scale of 1-3 days. |
| | Response resources not available | Pre-deployment of shoreline protection boom equipment (such as Muiron Islands and along the Ningaloo Coast) during operations. | On standby 24/7 during operations to expedite initiation of shoreline protection operations. | Small | 1 | 0-1 | Moderate, includes standby crew | H | H | L | L | H | The environmental benefit associated with the pre-deployment of shoreline protection boom along the Muiron and Ningaloo Coast during operations to reduce the amount of time lost prior to the first contact of hydrocarbons on the shoreline is considered significant.<br><br>This has the potential to reduce the severity of environmental impact. | The response capacity is small, but the control effectiveness is moderate as the control would have a low survivability. Cost during activation would be high. | **Reject:** These controls have high costs that are disproportionate to the potential environmental benefit that might be gained. This control would have a low survivability (i.e., boom integrity may decrease with time in the period when no |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | | | | | | | | hydrocarbon is in the near-shore zone), and hence no potential increase in any environmental benefit. Sufficient equipment for Yardie Creek and Mangrove Bay are available in Exmouth, which is the closest oil spill equipment storage location. |
| | Response resources not available. | Improved access to equipment deployment location. | Expedite initiation of shoreline protection operations through improved shoreline access. | Small | 1 | 0-1 | Moderate, includes standby crew | H | H | L | H | H | The environmental benefit associated with widening access paths to the inlet at Mangrove bay to reduce the time to move equipment to the deployment location, however, this would affect natural vegetation and deemed to increase tourist impacts in areas with little current impact.<br><br>This has the potential to reduce the environmental severity from a Material Risk rating of 5 (serious or extensive impacts <20 years) to a Non-Material Risk rating of 4 (major impacts <5 years). | The negative environmental benefit did not warrant the inconvenience of using wheelbarrows and using manual labour initially as timeframe for deployment before hydrocarbon arrival would still be met | **Reject:** This control is rejected due to the negative environmental impacts that would occur for a spill incident that has a very low likelihood. |

**Response Preparedness Performance Standards – Shoreline Protection**

| Spill Response Preparedness – Shoreline Protection | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| APPEA Memorandum of Understanding: Mutual Aid | BHP shall be a signatory to the APPEA Memorandum of Understanding: Mutual Aid to enable access to industry resource. | APPEA MoU | APU Operations Manager |
| Service Contract | BHP shall have a contract in place with OSROs (AMOSC and OSRL) to facilitate access to industry shoreline protection equipment and trained response personnel. | Service Level Agreement | APU Operations Manager |
| | BHP shall maintain a contract with a labour-hire company to enable the engagement of a minimum of 200 personnel within 48 hours of a Level 2 / Level 3 spill event and a minimum of an additional 500 personnel within 3 weeks of a Level 2 / Level 3 spill event. | Service Level Agreement | APU Operations Manager |
| | BHP shall maintain contractual arrangements with logistics service providers to enable the deployment of industry equipment to priority protection areas. | Service Level Agreement | APU Operations Manager |
| Monitoring of vessel availability & status | BHP shall maintain the Global Contractor Management System (GCMS) to monitor regionally available OSV on a monthly basis during the activity. | Vessel monitoring / availability records | APU Operations Manager |

| Spill Response Preparedness – Shoreline Protection | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| Response Timing | BHP shall maintain arrangements to facilitate:<br>• the mobilisation of initial (first strike) response crews to priority protection areas (as determined by and at the direction of WA DoT) within 24 hours of a spill event with the potential to impact State lands;<br>• the deployment of a minimum of 200 response personnel to priority protection areas (as determined by and at the direction of WA DoT) within 96 hours of a Level 2 / Level 3 spill event occurring;<br>• the deployment of up to 700 response personnel to priority protection areas (as determined by and at the direction of WA DoT) within 3 weeks of a Level 2 / Level 3 spill event occurring;<br>• the deployment of additional response personnel to peak workforce capacity at the direction of DoT until the response is terminated; and<br>• sufficient and appropriate equipment to establish and sustain a minimum of 5x Forward Operating Bases (at priority locations determined by the WA DoT) within 96 hours of a Level 2 / Level 3 spill event occurring. | Vessel monitoring / availability records | APU Operations Manager |

**Demonstration of Acceptability – Shoreline Protection**

- The strategy is consistent with the WA State Hazard Plan Maritime Environmental Emergencies (SHPMEE) and the WA DoT Oil Spill Contingency Plan (DoT OSCP). Shoreline protection does not contravene any relevant Plan of Management for a World Heritage place, National Heritage place or Ramsar wetland identified within the EMBA;
- BHP has undertaken a detailed ALARP evaluation to consider additional or improved response arrangements with adopted controls presented within *the Pyrenees Phase 4 Infill Drilling Oil Pollution Emergency Plan* (OPEP) (BHPB-04PY-N950-0022);
- BHP has undertaken engagement with WA DoT (as Controlling Agency in WA State Jurisdiction) in a manner consistent with the Offshore Petroleum Industry Guidance Note Marine Oil Pollution: Response and Consultation Arrangements (DoT, July 2020);
- Relevant listed species recovery plans, conservation advice and threat abatement plans have been considered within the environmental impact and risk evaluation detailed in Section 8.3 (Shoreline Response Options) and have been used to inform the development of mitigative control measures;
- Response arrangements (personnel and equipment) detailed for the implementation of shoreline protection have been agreed with the WA DoT and are commensurate with the nature and scale of a potential worst-case spill event within State jurisdiction;
- BHP has further committed to supplying additional response personnel and equipment at the direction of the WA DoT based upon an evaluation of response need post-spill;
- Response timing for shoreline protection operations is consistent with WA DoT guidance.
- Given the spill response preparedness measures detailed within this section, BHP consider the Environmental Performance Outcome of 'BHP prepared to respond to a potential WCD scenario in an effective and timely manner' will be achieved.

### 7.2.12 Shoreline Clean-Up (RS8)

**Summary of Activity – Shoreline Clean-up (Tier 2)**

The basis of assessment for shoreline clean-up relates highest accumulated shoreline loading above moderate threshold (100 g/m$^2$) and the longest length (km) of shoreline oiled >100 g/m$^2$ (Table 4-2). For an LOWC event, shoreline loading has been modelled up to 18,370 tonnes across all shorelines and up to 10,797 tonnes at the Ningaloo Region (Figure 4-1 and Figure 4-2). Spill modelling indicates the Ningaloo Region is potentially exposed to moderate levels of shoreline loading after day 2 of the release (with the highest potential over summer months).

However, by BHP initiating a combined response strategy and assuming the successful deployment of the CSS within define timeframes, the oil spill budget presented within Section 6.3.4 (Source Control + SSDI + SDA) the peak load across all shorelines potentially reduce to between 28% to 47% compared with the unmitigated peak load. Whilst peak load across all shorelines may be reduced significantly via a combined response, the total peak load at the Ningaloo Region was substantially reduced primarily via SDA (~3,000 tonnes), therefore the basis of shoreline clean-up response strategy shall be focussed on peak loading at Ningaloo Region assuming the implementation of SDA.

By applying a bulking factor of 10x the volume of the oil stranded on the shoreline (as described in Section 6.3.8) it is anticipated a total volume of up to 78,000 tonnes of oil contaminated waste material may require clean-up across the Ningaloo Region.

Shoreline clean-up will be carried out as directed by the Western Australian Department of Transport (WA DoT), as the Controlling Agency in State waters.

Whilst DoT will determine protection priorities post-spill, the basis for the initial shoreline clean-up response corresponds to the TRPs previous described in Section 7.2.11.

Shoreline clean-up will be required where actionable thresholds of shoreline oiling are identified and when the Operational SIMA demonstrates a potential net environmental benefit. Shoreline clean-up is logistically and labour intensive, requiring multiple vessels, equipment, clean-up crews and waste management. Shoreline clean-up involves the physical removal of stranded oil from shorelines via a range of techniques including:

- Natural recovery;
- Sediment relocation;
- Mechanical clean-up using heavy machinery;
- Debris removal via manual bagging;
- Absorbents;
- Pumps and vacuums;
- Low-pressure flushing; and
- High-pressure flushing.

At the direction of WA DoT, BHP will use the information gained from implementation of the RS2 Monitor and Evaluate response strategy (Section 7.2.8), namely the spill trajectory modelling, to predict shorelines with potential to be impacted to inform shoreline clean-up activities. Through information gathered and assessed by the IMT and WA DoT, the trajectory of the spill towards the specific coast will be confirmed and the shoreline clean-up strategy will be implemented.

Shoreline clean-up strategies consider the following factors:

- Shoreline characteristics (substratum type, beach type, shoreline exposure, biological/ social/ heritage/ economic values; characteristics of the oil (i.e., degree of weathering); amount of oil present, distribution of the oil on the shoreline; shoreline sediment type);
- Logistic considerations (availability of access – personnel, equipment; waste removal); availability of equipment and labour; availability of waste storage areas);

- Operational risk assessment of potential shoreline clean-up methods will be captured leading to the development of Operational SIMAs;
- Damage to Aboriginal registered sites of cultural significance from shoreline clean-up activities; and
- The requirement for other Operators to enact their OPEP arrangement for sensitive receptors at their location of operations (for example, Chevron for Barrow Island).

An Operational SIMA will also be carried out for shoreline protection and clean-up in consultation with the WA DoT to inform the IAP. The specific clean-up techniques will be risk assessed and refined during development of the IAP to suit the circumstances of the incident response. The sensitivity of shorelines may vary depending on the time of year, such as shorelines and beaches used by birds and turtles for nesting. This will be considered during the Operation SIMA process.

Based on the IAP, Shoreline Clean-up and Assessment Technique (SCAT) teams shall be deployed for assessment of the shoreline and developing recommended clean-up strategies for the IMT planning and operations group. SCAT team members will include members trained in oil spill response measures and environmental and coastal sensitivities of the region. Ideally, each SCAT team will include a representative from the appropriate state agency (WA DoT/DBCA).

The SCAT teams will undertake systematic surveys of the shoreline that will be segmented into sections. The SCAT teams will then provide sketches and reports which will include recommendations for the most appropriate clean up strategy for the shoreline segment. This information will feed back to the IMT who will then prioritise areas for clean-up and allocate resources.

The SCAT teams will utilise techniques to determine appropriate termination end points for response in consultation with both WA DoT and DBCA. The endpoints can be determined by either:

- Qualitative field observations – to describe the presence or absence of stranded oil and/or the character of such oil;
- Quantitative field measurement methods – based on visual measurements and observations of the quantity of oil;
- Analytical measurement methods – typically require the collection of representative field samples and subsequent laboratory analysis; or
- Interpretive impact assessment methods – based on an evaluation of system impacts (i.e., SIMA).

**Potential Environmental Impacts and Risks – Shoreline Clean-up**

Potential environmental impacts and risks associated with shoreline clean up and mitigative control measures are summarised in Section 8.2 ‘Nearshore Response Operations’, and Section 8.3 for ‘Shoreline Response Operations’.

In summary, the physical clean-up activities associated with shoreline response strategy could result in trampling of shoreline habitats by response clean-up crew, heavy machinery and vessel anchoring damaging shoreline habitats and emergent reef features and Aboriginal registered sites of cultural significance; flushing and pressure washing procedures damaging habitats and alteration of beach profiles by removal/ relocation of sediment. The use of equipment, machinery, and clean-up personnel in some coastal environments, e.g., mangroves, turtle/ bird nesting beaches could potentially cause more damage than the stranded hydrocarbons themselves, thereby reducing the recovery and net environmental benefit of the clean-up strategy. Shoreline clean-up activities also present a risk of cross-contamination between oiled and non-oiled areas or further spreading of hydrocarbons. The movement of equipment and personnel and lighting onto turtle nesting beaches has the potential to disturb turtle nests and turtle nesting activities.

**Oil Spill Budget – Shoreline Clean-up**

As detailed in Section 6.3.8 ‘Shoreline Response’, a ‘rule of thumb’ estimate (IPIECA-IOGP, 2015c) of the impact of shoreline clean-up efforts on oil spill budget is that one person can remove 1–2 $m^3$ per day.

The following assumptions have been applied to determine possible response need for shoreline clean-up operations:

- a worst-case total volume of up to 78,000 tonnes of oil contaminated waste material that may require clean-up across the Ningaloo Region;
- greater than 100 $g/m^2$ loading for clean-up;
- all waste is removed by hand (although where practicable machinery may be deployed);
- 1 $m^3$ of contaminated sand / debris weights between 1.6 – 2 tonne (depending on dry / wet condition); and
- due to the remote location and climatic conditions of the Ningaloo coastline, one-person clean 1$m^3$ of waste per day.

Based upon the above, it may take up to 48,750 person days to clear all oil contaminated waste from the Ningaloo Region, although this estimate is highly conservative given it is based on the worst-case shoreline loading outcome and assumes all waste is cleared by hand. As described above, not all shoreline types are amenable to clean-up techniques.

Assuming multiple dedicated clean-up crews with a combined workforce of approximately 500 personnel, the clean-up operation may take 3-4 months to complete (pending actual shoreline loading volumes and environmental conditions).

**Response Arrangements – Shoreline Clean-up**

As directed by WA DoT, BHP will arrange for the call-up of the necessary personnel and logistics associated with maintaining those crews at the impact location, which includes the support arrangements to ensure the health, safety, and welfare of the shoreline crews. This includes availability of PPE, sun shelter, first aid supplies, catering, drinking water, ablutions, decontamination facilities, accommodation, transport, and communications to support the number of personnel expected to be required at the impact location.

**Procedures / Guidelines**

BHP Oil Spill Response Strategy – RS8 Shoreline Clean-up (AOHSE-ER-0058)

NP–GUI–025: National Plan response, assessment, and termination of cleaning for oil contaminated foreshores available from: https://www.amsa.gov.au/marine-environment/national-plan-maritime-environmental-emergencies/np-gui-025-national-plan

Tactical Response Plans (TRPs):

- Yardie Creek (AOHSE-ER-0068)
- Turquoise Bay (AOHSE-ER-0067)
- Mangrove Bay (AOHSE-ER-0065)
- Jurabi Point to Lighthouse beaches (AOHSE-ER-0064)
- Muiron Islands (AOHSE-ER-0066)

**Personnel**

As described in Section 7.1.3 'General Support', BHP would initiate the deployment of labour-hire personnel to staff shoreline clean-up crews in addition to BHP personnel. In consultation with WA DoT, BHP has committed to initially engaging between 200-700 labour-hire personnel in addition to BHP personnel and engage additional personnel as required at the direction of WA DoT. All personnel would receive relevant on-the-job training prior to undertaking shoreline clean-up operations.

**Equipment**

WA DoT currently has 3x trailable shoreline clean-up kits (with capacity to supply 25-50 clean-up personnel per kit) ready for deployment. AMSA also maintains national stockpiles of clean-up equipment that may be called upon by the WA DoT. In consultation with WA DoT, BHP has committed to supplying a further 5x comparable kits in the first instance, and further equipment as required to support clean-up operations at the direction of WA DoT.

AMOSC and Chevron (for Barrow Island) have shoreline clean-up and decontamination kits that can be utilised in the first strike capability. As a member company, BHP has access to industry equipment maintained by AMOSC.

Under an existing Service Level Agreement, BHP has access to OSRL equipment.

BHP has ready access to regionally available equipment such as PPE, shelter, accommodation units, vehicles, and machinery. Equipment required to perform clean-up operations can be sought through existing supplier and logistical arrangements. Additional clean-up equipment can be readily obtained from hardware/industrial suppliers and delivered to Exmouth to meet the arrival time of responders.

**Response Timing – Shoreline Clean-up**

In consultation with the WA DoT, BHP has committed to mobilising response resources (up to 200x personnel and 5x clean-up kits) to priority protection sites in the N.W. Region of Western Australia (including the Ningaloo / Exmouth Region) (as determined by WA DoT) within 96 hours from the spill event.

Supplementary resources (personnel and equipment) will continue to be deployed by BHP under the direction of the WA DoT until peak capacity is reached as deemed appropriate by WA DoT.

BHP shall maintain resourcing at levels determined by the WA DoT until termination of the response strategy.

**Legislative and Other Considerations – Shoreline Clean-up**

Shoreline clean-up operations are administered by WA DoT as the Controlling Agency within State jurisdiction.

BHP via the Joint Strategic Coordination Committee (JSCC) (as described within the *APU IMT Capability Assessment Report* (AOHSE-ER-0071) would engage with other relevant Western Australian State Departments such as the Western Australian Police Force, Department of Planning, Lands and Heritage, and the Department of Health in relation to emergency response arrangements in State jurisdiction.

*Logistical Constraints*

Accommodation: Availability of accommodation is a major constraint for the response. BHP has analysed the accommodation availability and options to increase availability for responders. Whilst Exmouth (and Onslow) has the potential to house a large influx of people, there are limitations on the amount of accommodation that would be deemed immediately suitable for a shoreline workforce being required to perform manual clean-up and other physical work. BHP would work with the Shires/providers to increase the availability of current accommodation in these locations as well as the alternative options such as the construction of remote camps to house a response workforce. A Barrow Island response will be coordinated by Chevron and will utilise in-situ accommodation.

Movement of personnel: Movement of personnel from their accommodation or transit point to the clean-up location can impact the effectiveness of the response. If the clean-up location requires a long commute the amount of effectiveness from the shoreline crews diminishes as the amount of time spent in the actual operation is reduced.

Weather: Storms may impede actual operations on the day or access to certain locations due to flooding. Shoreline crews will need to work around tidal movements on the beaches. Clean-up activities will be arranged around tidal cycles.

Access to areas requiring shoreline clean-up: There is access to coastline from Exmouth through to Yardie Creek using paved roads with access tracks to most beaches. Access to the nearshore islands would be via barge or small vessel.

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from the execution of this response strategy | No shoreline clean-up | Do nothing option | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option; experience from past oil spills suggests that environmental sensitivities can be protected effectively when shoreline clean-up operations are activated. | There may be occasions when shoreline clean-up is not implemented, e.g., during poor weather, but in general, the do-nothing option is not considered within the external context (e.g., stakeholder views) to be a viable option. | **Reject:** Shoreline clean-up is a recognised strategy for the mitigation of oil spill impacts. |
| **Separate** | Sensitive vegetation impacted by machinery | No machinery to be used in mangroves. No machinery to be used within 20 m of an identified turtle nest. | Separate the potential of impacts due to machinery on sensitive receptors. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by separating the potential of impacts due to machinery on sensitive receptors. | Control has high effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Control has no cost implications. | **Accept**: Control is practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |
| **Administrate** | Response strategy executed adhoc with no real planning | Shoreline clean-up operations reviewed and managed by IMT through Incident Action Plan (IAP) process. | Within the first 24 hours, the BHP IMT will develop IAPs. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of shoreline clean-up operations will take place almost immediately in the event of a Level 2 / 3 spill. The shoreline clean-up operations would be adapted based on real-time information regarding the spill incident: determine if sea state and weather conditions are conducive to operations and applicability with other response strategies. | Controls have high effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |
| | Response activities not considered in preparedness planning therefore not allowing for input into the Operational SIMA. | Operational SIMA to include evaluation of requirement for implementation of shoreline clean-up operations. | The shoreline clean-up response strategy will be activated if Operational SIMA indicates the implementation would provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors. | N/A | N/A | <2 hours from IMT forming | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational SIMA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather, and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. | | |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) | | | | | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | | | |
| | Poor situational awareness and understanding of oil spill trajectory prior to response execution (i.e., oil could be heading out to sea). | Modelling predictions of oil trajectory to be undertaken to support the Operational SIMA. | Used as tool to gain situational awareness through real-time spill trajectory modelling to enable direction of daily shoreline clean-up operations. | N/A | N/A | <2 hours from IMT forming | Minor | H | H | H | H | H | Shoreline clean-up will be activated if the Operational SIMA indicates the potential harm of implementation is less than leaving the oil untreated on the shoreline; and if the implementation of the response strategy would provide a net environmental benefit to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors. | | |
| | Response strategy not executed effectively through planning or fast enough to prevent impact highly sensitive areas impacted | In agreement with WA DoT, implement shoreline clean-up response strategy in accordance with optional shoreline protection methods for different coastal types (refer to Table 8-6; and North West Cape Sensitivity Mapping (AOHSE-ER-0036). | Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by using established shoreline protection plans to increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation. | | |
| | Deployment of resources ineffective due to poor understanding of impact area | Conduct observations/ surveys prior to deployment of equipment and personnel to develop a deployment/ operations plan, which includes avoidance of impacts to wildlife, organisation of ground disturbance, protection of sensitive areas, and consultation with DBCA and local stakeholders. | Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity. | N/A | N/A | N/A | Minor | H | H | H | H | H | Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity. | | |
| | Poor shorelines clean up practices with remobilisation of oil in the marine environment | Prevent further surface water contamination by conducting all flushing clean-up activities to a contained area. | Ensures that shoreline accumulated oil is contained and that impacts are not spread across a wider area. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by ensuring that shoreline accumulated oil is contained and that impacts are not spread across a wider area. | | |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | Poor understanding of the effectiveness of shoreline clean up and its impact on the environment | Implement environmental monitoring to determine the ongoing acceptability of the environmental risk associated with the application of shoreline clean-up methods. | Water, sediment, and benthic infauna quality monitoring to evaluate the effectiveness of shoreline clean-up techniques. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by understanding the effectiveness of shoreline clean-up techniques. | | |
| | Shoreline activities impacting areas of cultural significance | Shoreline clean-up operations will avoid cultural heritage sensitivities. | Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural significance. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to sensitive cultural heritage sensitivities. | | |
| | Response continues with no end point or is removed early | Response strategy activities continued until termination criteria met as determined by WA DoT. | Ensures that the shoreline response strategy continues until the performance outcome has been achieved. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from ensuring that the shoreline clean-up response strategy continues until the performance outcome has been achieved. | | |
| **Administrate** | Response resources not available | Access to shoreline clean-up equipment owned by AMOSC (in Exmouth, Fremantle, Dampier, and Geelong). | Mobilisation of AMOSC owned shoreline clean-up equipment from Exmouth / Fremantle / Geelong. | Small | AMOSC | 1-2 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective of shoreline clean-up is to remove the oil from shoreline sensitivities. | The response capacity is small, but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC / OSRL. Control has minor cost implications. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Response resources not available | Access to shoreline clean-up equipment owned by OSRL | Mobilisation of OSRL shoreline clean-up equipment from Singapore and other countries. | Small | OSRL | < 24 hours to mobilise; onsite > 7 days | Minor | Low (due to time to mobilise) | H | H | H | H | | | |
| | Response resources not available | Access to small support vessels (AMOSC, local charter) | Mobilisation of AMOSC owned small craft from Geelong and / or vessels of opportunity available on the local spot charter market in Exmouth. | Small | 4 | 7 | Minor | H | H | H | H | H | The environmental benefit associated with shoreline clean-up is potentially significant, which has the potential to reduce the environmental severity from a Material Risk rating of 5 (serious or extensive impacts <20 years) to a Non-Material Risk rating of 4 (major impacts <5 years). | The response capacity is small for vessel operations, but the control effectiveness is generally high (vessel operations are only possible during daylight hours) and the cost of using marine vessels available through AMOSC and on the local spot-charter market in Exmouth / Dampier / | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Mobilisation of response personnel to impact location delayed | Mobilise First Strike Team to Exmouth within 24 hours following | Mobilisation of BHP personnel from Perth to provide first- | Small | BHP | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective is to provide | | |

PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | notification by IMT. | hand situational awareness to the IMT. | | | | | | | | | | first-hand situational awareness to the IMT. | Broome has minor cost implications. | |
| | No arrangement with third-party services leading to insufficient resourcing during response | AMOSC and OSRL contracts and other third-party agreements for provision of resources for shoreline clean-up in place during operations. | Mobilisation of AMOSC / OSR: personnel to provide situational awareness and expert advice to the IMT on clean-up protection priorities. | Small | AMOSC / OSRL | 0-4 | Minor | H | H | H | H | H | Positive environmental benefit gained from mobilisation of AMOSC / OSRL personnel to provide situational awareness and expert advice to the IMT on clean-up protection priorities. | | |
| Administrate | Response resources not available | Support vessels (Perth / Australia). | Acquisition of more support vessels via charter on the spot-market from Perth and around Australia. | Small | As required | 3 | Moderate | H | H | H | H | H | The environmental benefit associated with shoreline protection is considered to be significant, which has the potential to reduce the environmental severity from a Material Risk rating of 5 (serious or extensive impacts <20 years) to a Non-Material Risk rating of 4 (major impacts <5 years). | The response capacity is small, but the control effectiveness is generally high and the cost of acquiring small marine vessels and more equipment as required through the spot-charter market around Australia and SE Asia has minor cost implications. Cost during activation would be moderate. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | Response resources not available | Access to more oil spill responders. | Acquisition of more oil spill responders (skilled and unskilled) from AMOSC / OSRL and resource labour companies (e.g., Hays) in Perth and around Australia. | Small | As required | | Moderate | H | H | H | H | H | Scalable options involve accessing more vessels, equipment, and resources from around Australia and the broader region including SE Asia. | | |

**Response Preparedness Performance Standards – Shoreline Clean-up**

| Spill Response Preparedness – Shoreline Clean-up | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| APPEA Memorandum of Understanding: Mutual Aid | BHP shall be a signatory to the APPEA Memorandum of Understanding: Mutual Aid to enable access to industry resource. | APPEA MoU | APU Operations Manager |
| Service Contract | BHP shall have a contract in place with OSROs (AMOSC and OSRL) to facilitate access to industry shoreline clean-up equipment and trained response personnel. | Service Level Agreement | APU Operations Manager |

| Spill Response Preparedness – Shoreline Clean-up | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| | BHP shall maintain a contract with a labour-hire company to enable the engagement of a minimum of 200 personnel within 48 hours of a Level 2 / Level 3 spill event and a minimum of an additional 500 personnel within 3 weeks of a Level 2 / Level 3 spill event. | Service Level Agreement | APU Operations Manager |
| | BHP shall maintain contractual arrangements with logistics service providers to enable the deployment of industry equipment to priority protection areas. | Service Level Agreement | APU Operations Manager |
| Equipment | BHP shall make available a minimum of 5x shoreline clean-up kits with each kit having sufficient equipment to supply 25-50 response personnel and comparable to those maintained by the WA DoT. | Response records | BHP IMT IC |
| | BHP shall make available light and heavy machinery (and trained Operators) to undertake shoreline clean-up operations at the direction of WA DoT. | Response records | BHP IMT IC |
| Response Timing | BHP shall maintain arrangements to facilitate:<br>• the mobilisation of initial (first strike) response crews to priority protection areas (as determined by and at the direction of WA DoT) within 24 hours of a spill event with the potential to impact State lands;<br>• the deployment of a minimum of 200 response personnel to priority protection areas (as determined by and at the direction of WA DoT) within 96 hours of a Level 2 / Level 3 spill event occurring;<br>• the deployment of a up to 700 response personnel to priority protection areas (as determined by and at the direction of WA DoT) within 3 weeks of a Level 2 / Level 3 spill event occurring;<br>• the deployment of additional response personnel to peak workforce capacity at the direction of WA DoT until the response is terminated; and<br>• supply a minimum of 5x shoreline clean-up kits comparable to those maintained by the DoT and mobilised to priority protection areas (as determined by the WA DoT) within 96 hours of a Level 2 / Level 3 spill event occurring. | Exercise records | APU Operations Manager |

**Demonstration of Acceptability – Shoreline Clean-up**

- The strategy is consistent with the WA State Hazard Plan Maritime Environmental Emergencies (SHPMEE) and the WA DoT Oil Spill Contingency Plan (DoT OSCP). Additionally, relevant guidance under the National Plan for Maritime Emergencies (NatPlan) has been considered. Shoreline clean-up does not contravene any relevant Plan of Management for a World Heritage place, National Heritage place or Ramsar wetland identified within the EMBA;
- BHP has undertaken a detailed ALARP evaluation to consider additional or improved response arrangements with adopted controls presented within the *Pyrenees Phase 4 Infill Drilling Oil Pollution Emergency Plan* (OPEP) (BHPB-04PY-N950-0022);
- BHP has undertaken engagement with WA DoT (as Controlling Agency in WA State Jurisdiction) in a manner consistent with the Offshore Petroleum Industry Guidance Note Marine Oil Pollution: Response and Consultation Arrangements (WA DoT, July 2020);
- Relevant listed species recovery plans, conservation advice and threat abatement plans have been considered within the environmental impact and risk evaluation detailed in Section 8.3 (Shoreline Response Options) and have been used to inform the development of mitigative control measures;
- Response arrangements (personnel and equipment) detailed for the implementation of shoreline clean-up have been agreed with the WA DoT and are commensurate with the nature and scale of a potential worst-case spill event within State jurisdiction;
- BHP has further committed to supplying additional response personnel and equipment at the direction of the WA DoT based upon an evaluation of response need post-spill;
- Response timing for shoreline clean-up operations is consistent with WA DoT guidance;
- Given the spill response preparedness measures detailed within this section, BHP consider the Environmental Performance outcome of ‘BHP prepared to respond to a potential WCD scenario in an effective and timely manner’ will be achieved.

### 7.2.13 Natural Recovery (RS9)

**Summary of Activity**

Natural recovery, as the title suggests, makes use of the natural degradation and weathering processes to breakdown, and remove surface oil and stranded hydrocarbons. Effectively this response strategy means that no direct action is taken other than to monitor and evaluate the oil spill trajectory, the rate of dispersion of the diesel or crude oil, and the rate of habitat/community recovery. As such, no additional risks or impacts will occur, other than those already described previously.

### 7.2.14 Environmental Monitoring (RS10)

**Summary of Activity – Environmental Monitoring (Tier 2 – Tier 3)**

Part A of the *Pyrenees Field: Operational and Scientific Monitoring Bridging Implementation Plan* (BHPB-04PY-N950-0023) (Appendix C of the OPEP) provides a detailed description of BHP preparedness to implement monitoring operations so environmental monitoring arrangements are not discussed further within this document.

**Potential Environmental Impacts and Risks – Environmental Monitoring**

There are no additional environmental impacts and risks associated with an environmental monitoring in offshore waters to those already described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021) and summarised in Section 8.1 for 'Offshore Response Operations'.

Potential environmental impacts and risks associated with nearshore environmental monitoring and mitigative control measures are summarised in Section 8.2 for 'Nearshore Response Operations'.

Potential environmental impacts and risks associated with nearshore environmental monitoring and mitigative control measures are summarised in Section 8.3 for 'Shoreline Response Operations'.

### 7.2.15 Oiled Wildlife Response (RS11)

**Summary of Activity – Oiled Wildlife Response (Tier 2)**

Basis of Assessment for oiled wildlife response relates to the following response planning thresholds (refer Table 4-2):

- Longest length (km) or number of segments of shoreline oiled >10 g/m$^2$
- Minimum time to shoreline contact for oil >10 g/m$^2$
- Longest length (km) or number of segments of shoreline oiled >100 g/m$^2$
- Minimum time to shoreline contact for oil >100 g/m$^2$
- Highest accumulated shoreline loading above moderate threshold (100 g/m$^2$)

The overall aim of the Oiled Wildlife Response Strategy is to mitigate the effects of oil on wildlife. Specifically, the response strategy seeks to define a system that addresses the overall aim focussing on the following key objectives:

- Respond safely and efficiently to oiled wildlife;
- Protect the health and welfare of wildlife threatened or impacted by oil;
- Co-ordinate field reconnaissance of at risk or impacted wildlife;
- Prevent or minimise exposure of wildlife to oil where possible;
- Recover oiled wildlife in a safe and effective manner;
- Prioritise the treatment of species of conservation value when resources are limited;

- Establish an effective system for the treatment and rehabilitation of oiled wildlife;
- Release wildlife back into the wild as healthy, contributing members of a population; and
- Identify and remove dead oiled wildlife from the coastal environment.

Oiled wildlife response will be carried out in consultation with the DBCA and as directed by the WA DoT, as the Controlling Agency in State waters and consistent with the Western Australia Oiled Wildlife Response Plan (WAOWRP) and Pilbara Region Oiled Wildlife Response Plan (PROWRP).

Oiled wildlife response includes pre-oiling activities such as the installation of onshore exclusion barriers (e.g. fencing) to stop shorebirds and terrestrial fauna gaining access to shoreline areas affected by the hydrocarbon spill; hazing techniques, either on the water or on shorelines and may involve a combination of visual and auditory devices to shepherd fauna away from oil slicks or oiled shorelines; and pre-emptive capture and removal of fauna that may otherwise come into contact with oil if they were to stay in the area.

Post-oiling activities will include the collection and rehabilitation to treat oiled fauna at dedicated Oiled Wildlife Response Centres and once treated, to return them to similar suitable habitat.

**Potential Environmental Impacts and Risks – Oiled Wildlife Response**

The potential risks associated with fauna handling / interaction are detailed in Section 8.1 for 'Offshore Response Operations', Section 8.2 for 'Nearshore Response Operations', Section 8.3 for 'Shoreline Response Operations' and can be summarised as:

- Non-oiled fauna may be accidentally driven into surface oil slicks or impacted shorelines during hazing and pre-emptive capture activities resulting in increased numbers of oiled wildlife;
- During hazing and pre-emptive capture activities, oiled fauna may be accidentally driven into surface oil slicks or impacted shorelines rather than away from oil during hazing activities;
- Inappropriate equipment and capture techniques resulting in distress, fatigue, injury and/ or the separation of faunal groups (adult/juvenile pairs);
- Inadequate/ inappropriate cleaning and husbandry techniques/ conditions resulting in distress, disease and/ or injury; and
- Release of captured wildlife to inappropriate relocation areas.

**Response Arrangements – Oiled Wildlife Response**

Arrangements for OWR in Western Australia are detailed within the WAOWRP and PROWRP.

Under advice from the DBCA, the draft update to WAOWRP applies a high / medium / low risk profile to OWR rather than the current level 1 – 6 approach. BHP Pyrenees Phase 4 spill risk profile would likely be categorised as high-risk under the new approach.

A 'high-risk' OWR strategy would likely require a minimum of 80 OW Responders.

AMOSC manages a database of trained / qualified OW Responders from industry that could be called upon to support a response. At the time of writing, DBCA is aiming to create a database derived from licensed rehabilitators and regional veterinary staff which likewise will be available to industry once developed.

AMOSC maintains 3x oiled wildlife (washing) containers.

OWR associated with a WCD from the Pyrenees Field would require the establishment of multiple 'field oiled wildlife facility' with each supported by at least 5x trained oiled wildlife responders, inclusive of a Veterinarian.

The purpose of each field facility is early triage and field processing of oiled animals and acting as a base for reconnaissance and rescue. Reconnaissance and rescue requires at least 2 of the 5 trained OW responders in a field unit. Field processing and early triage would require at least 2 of the 5 trained OW Responders including the Veterinarian.

It is anticipated at least 5x field facilities would be required within the Ningaloo / Exmouth Region.

In addition to the field facilities, a larger ‘primary care’ facility must be established. The purpose of the Primary Care Facility is stabilisation, cleaning, and rehabilitation.

A list of suppliers of oiled wildlife response equipment, and contractors in WA, is provided in Appendix G and Appendix K of the Pilbara Region Oiled Wildlife Response Plan (PROWRP). Through its arrangements with AMOSC, BHP has access to equipment sufficient to construct 2x OWR Washing and Rehabilitation facilities to treat 1,000 oiled wildlife units. This includes contracts with vendors to construct the facility. If the spill demanded a larger oiled wildlife response, additional response equipment would be purchased in an ongoing basis from suppliers/contractors, as detailed in the Appendices of the PROWRP.

Any gaps in the equipment requirements to meet the needs of the oiled wildlife response, whatever level it may be, will be filled by the ongoing procurement of oiled wildlife equipment using the lists and suppliers identified above, and/or sourcing more equipment from international response agencies including OSRL, if equipment within Australia was exhausted.

**Response Timing – Oiled Wildlife Response**

First-strike response priority would be to establish a ‘field oiled wildlife facility’ (within approx. 24-48 hours).

The DBCA have indicated the establishment of a Primary Care Facility would require significant planning and a large amount of support infrastructure. Mobilisation of washing containers would be part of developing the Primary Care Facility. It is anticipated the establishment of a functional Primary Care Facility would take between 1-2 weeks to be operational.

**Legislative and Other Considerations – Oiled Wildlife Response**

Specific wildlife permits are now required from the DBCA for activities involving the protection and treatment of wildlife during an Oiled Wildlife Response, including those listed below:

- Hazing: deterring wildlife from entering oiled sites;
- Pre-emptive capture: capturing and holding (or translocating) wildlife;
- Recovery of oiled wildlife from the environment;
- Treatment and rehabilitation of oil impacted wildlife;
- Release of rehabilitated wildlife;
- The humane euthanasia of oiled animals as necessary (under veterinary direction); and
- The retrieval of dead oiled wildlife from the marine and coastal environment.

**ALARP Evaluation – Oiled Wildlife Response**

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from the execution of this response strategy | No oiled wildlife response | Do nothing option | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environment benefit would be gained from this option. | This control is practicable and not implementing it would not be satisfactory from a stakeholder perspective. | **Reject:** Oiled wildlife response is a recognised strategy for preventing impacts of an oil spill on environmental sensitivities. |
| **Administrate** | Response strategy executed adhoc with no real planning leading to ineffective response. | Oiled wildlife response operations will be reviewed and managed by IMT through Incident Action Plan (IAP) process. | Within the first 24 hours, the BHP IMT will develop IAPs. | N/A | N/A | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of oiled wildlife operations will take place almost immediately in the event of a Level 3 spill. The oiled wildlife operations would be adapted based on real-time information (situational awareness / OSTM) regarding the spill incident to inform collection of wildlife. | Controls have high effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |
| | Response activities not considered in preparedness planning therefore not allowing for input into the Operational SIMA. | Operational SIMA to include evaluation of requirement for implementation of oiled wildlife response. | The oiled wildlife response strategy will be activated if Operational SIMA indicates the implementation would provide a net environmental benefit in preventing impacts to sensitive receptors. | N/A | N/A | 0-1 | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational SIMA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather, and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors.<br><br>Oiled wildlife response will be activated by the Operational SIMA to prevent impacts to sensitive receptors. | | |
| | Unsuitably qualified personnel. | Lead response personnel are trained and experienced for the activities to which they are assigned. | Use of skilled personnel to implement oiled wildlife response will increase efficiency of oil spill protection efforts. | N/A | N/A | 5 | Minor | H | H | H | H | H | Positive environmental benefit gained by using skilled personnel to implement oiled wildlife response following Industry and WA State Government drafted guidelines, which will increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation. | | |
| | Response strategy executed adhoc with no real planning leading to ineffective response. | Activation and implementation of oiled wildlife response will follow pre-designated plans for establishing works areas, as described in Western Australian Oiled Wildlife Response plan (WAOWRP); and Pilbara Region Oiled Wildlife | Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity. | N/A | N/A | 5 | Minor | H | H | H | H | H | | | |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) | | | | | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | | | |
| | | Response Plan (PROWRP). | | | | | | | | | | | | | |
| | Response activities impacting areas of cultural significance. | Oiled wildlife response operations will avoid cultural heritage sensitivities. | Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural significance. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to sensitive cultural heritage sensitivities. | | |
| | Response continues with no end point or is removed early. | Response strategy activities continued until termination criteria met. | Ensures that the oiled wildlife response strategy continues until the performance outcome has been achieved. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from ensuring that the oiled wildlife response strategy continues until the performance outcome has been achieved. | | |
| **Administrate** | No access to suitable specialised equipment in reasonable timeframes. | Access to containerised oiled wildlife wash facility (via AMOSC contract) and trained responders, mobilisation within 24 h of notification by Incident Commander with establishment of Primary Facility in 1-2 weeks. | Contract with AMOSC for mobilisation to Exmouth and access to resources and equipment. | N/A | N/A | 1-2 weeks | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective of oiled wildlife response is to prevent effects of an oil spill on environmental sensitivities. | The response capacity is small, but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC. Control has minor cost implications. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| **Administrate** | Insufficient specialised personnel available – resourcing. | Access to more oiled wildlife responders. | Mobilise more oiled wildlife responders from around Australia and SE Asia. | N/A | N/A | 14-21 | Minor | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective of oiled wildlife response strategy is to prevent effects of an oil spill on environmental sensitivities. | The response capacity is small, but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC. Control has minor cost implications. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| | No access to suitable specialised equipment in reasonable timeframes. | Pre-deployment of oiled wildlife container on standby at Exmouth during operations. | On standby 24/7 during operations to expedite initiation of environmental monitoring operations. | Small | 1 | 0-1 | Moderate | H | H | Low | H | H | The environmental benefit associated with oiled wildlife response strategy is considered to be significant, which has the potential to reduce the environmental severity from a spill. Scalable options for oiled wildlife response involve a pre-deployment and establishment of the oiled wildlife facility to be on standby, fully functional, and capable of receiving oiled wildlife on Day 1 of an incident. | Dedicated standby oiled wildlife crews have substantial cost. | **Reject**: This control has moderate costs that are disproportionate to the potential environmental benefit that might be gained particularly taking into consideration the availability and mobility of the containerised oiled wildlife wash facility operated by AMOSC and available in Perth, |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time (days) | Cost | Effectiveness (L/M/H) | | | | | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | | | |
| | | | | | | | | | | | | | | | i.e., 36 hours by road freight once activated by the BHP IMT. |

**Response Preparedness Performance Standards – Oiled Wildlife Response**

| Spill Response Preparedness – Oiled Wildlife Response | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| APPEA Memorandum of Understanding: Mutual Aid | BHP shall be a signatory to the APPEA Memorandum of Understanding: Mutual Aid to enable access to industry resource. | APPEA MoU | APU Operations Manager |
| Service Contract | BHP shall have a contract in place with AMOSC to facilitate access to industry oiled wildlife equipment and trained response personnel. | Service Level Agreement | APU Operations Manager |
| | BHP shall maintain contractual arrangements with logistics service providers to enable the deployment of industry equipment to stage areas determined by WA DoT / DBCA. | Service Level Agreement | APU Operations Manager |
| Response Timing | BHP shall maintain arrangements to facilitate:<br>• the mobilisation of initial (first strike) response crews and establish one or multiple 'field oiled wildlife facility' (as determined by and at the direction of WA DoT/DBCA) within 48 hours of a spill event with the potential to impact State lands;<br>• the establishment of a 'Primary Care Facility' (as determined by and at the direction of WA DoT/DBCA) within 2 weeks. | Exercise records | APU Operations Manager |

**Demonstration of Acceptability – Oiled Wildlife Response**

- The strategy is consistent with the Western Australia Oiled Wildlife Response Plan (WAOWRP). OWR does not contravene any relevant Plan of Management for a World Heritage place, National Heritage place or Ramsar wetland identified within the EMBA;
- BHP has undertaken a detailed ALARP evaluation to consider additional or improved response arrangements;
- BHP has undertaken engagement with WA DoT (as Controlling Agency in WA State Jurisdiction) and the DBCA in relation to OWR arrangements and relevant advice has been adopted by BHP;
- Response arrangements (personnel and equipment) detailed for the implementation of OWR have been agreed with the WA DoT and DBCA and are commensurate with the nature and scale of a potential worst-case spill event within State jurisdiction;
- Response timing for OWR operations is consistent with DBCA guidance;
- Given the spill response preparedness measures detailed within this section, BHP consider the Environmental Performance Outcome of 'BHP prepared to respond to a potential WCD scenario in an effective and timely manner' will be achieved.

### 7.2.16 Forward Operating Base (RS12)

**Summary of Activity – Forward Operating Base (Tier 2)**

Constant monitoring and evaluation by people on-location is a mandatory strategy required for real-time decision-making during a spill event. The objective of this response strategy is to assist the IMT in planning the oil spill response activities in the spill zone by assisting in the development of incident action plans, oversee field operations, manage rosters, and provide situational briefings/debriefings. Personnel within the forward command post will also maintain liaison with local emergency service organisations, industry, and other government departments active in the spill zone. The forward operating base will be established at Harold E Holt Naval Communications Base or the Exmouth SES Offices, or another appropriate building.

**Potential Environmental Impacts and Risks – Forward Operating Base**

There are no relevant environmental risks and impacts associated with mobilising BHP employees and third-party contractors to Exmouth to establish a Forward Operating Base outside of standard BHP HSE requirements.

**Response Arrangements – Forward Operating Base**

BHP has arrangements in place to establish the FOB at Harold E Holt Naval Communications Base or the Exmouth SES Offices.

### 7.2.17 Oil Contaminated Waste Management (RS13)

**Summary of Activity (Tier 2)**

During an oil spill clean-up, the disposal of waste material must not pose any threat to the health and safety of people or the environment and must be carried out in accordance with relevant State legislation. The type and amount of waste generated will depend on the spill itself and its location. It is important to note that the volumes of oily waste recovered from shorelines may be significantly greater than the volume of oil spilled. Typical waste volumes generated will be influenced by a bulking factor of:

- For offshore recovery there is a 1:10 increase in waste volume generation due to water being collected with the oil and emulsification occurring; and
- For shoreline clean-up there is a 1:10 increase of waste volume generation due to collection of sand and detritus from the high-water mark and surrounding environment.

Table 7-4 identifies the types of waste likely to be generated from a spill from the operations.

**Table 7-4: Response strategies and their effect on waste generation**

| Response Strategy | Effect on Waste Stream | Type of Waste Generated |
|---|---|---|
| Dispersant Application | Waste concentrations are minimal as the oil is suspended in the water column and allowed to biodegrade naturally. | • No hydrocarbon waste is generated<br>• Personal protective equipment (PPE)<br>• Empty dispersant drums/ considerations |
| At Sea Response Operations | Recovery operations will potentially give rise to a large quantity of waste oil and water for treatment. The volume of the storage systems available must be consistent with the recovery capacity of the skimmers.<br><br>The type of oil spilled will have an effect on the resultant waste; viscous and waxy oils in particular will entrain debris and can create large volumes of waste. They can also present severe handling difficulties. | • Oiled equipment/vessels<br>• Oiled PPE and workforce<br>• Recovered oil<br>• Oily water<br>• Oiled vegetation<br>• Oiled sorbent materials<br>• Oiled flotsam and jetsam<br>• Animal carcasses |

| Response Strategy | Effect on Waste Stream | Type of Waste Generated |
|---|---|---|
| Shoreline Clean-up | The type of spilled oil will often have a profound effect on the amount of oily waste generated.<br>Waste segregation and minimisation techniques are critical to ensure an efficient operation. These should be established at the initial recovery site and maintained right through to the final disposal site otherwise waste volumes will spiral out of control.<br>Waste sites should be managed in such a way as to prevent secondary pollution. | • Oiled equipment/vessels<br>• Oiled PPE and workforce<br>• Recovered oil<br>• Oiled vegetation<br>• Oily water<br>• Oiled sorbent materials<br>• Oiled beach material, sand<br>• Oiled flotsam and jetsam<br>• Animal carcasses<br>• Oiled transport |

For any spill likely to produce significant amounts of waste, a Waste Management Plan will be developed to ensure that:

- Oily waste is properly handled and stored;
- Oil and oily debris is adequately segregated, treated, and stored at the point of collection;
- Oil and oily debris is rapidly collected and taken to designated sites for storage, treatment, or disposal; and
- Treatment or disposal practices ensure that the waste poses no future threat to the environment.

In addition, the Waste Management Plan will identify how waste volumes will be minimised (Table 7-5).

**Table 7-5: Waste management hierarchy**

| Waste Management Hierarchy | |
|---|---|
| Reduction | Efficient response strategies selected for oil spill clean-up to ensure that the minimum material is used and/or contaminated during the process. |
| Reuse | This is the reuse of an item for its original purpose, i.e., clean-up equipment should be cleaned and reused in place of disposable items. An example might be the cleaning of PPE so that it can be reused. |
| Recovery | This is the production of marketable product for waste, e.g., taking waste oil to a refinery for conversion into other useable products. This will be directly affected by the quality of the recovered product, i.e., highly contaminated material is less likely to be suitable for recycling. |
| Refuse | Refuse is the final and least desirable option. If none of the above methods can be carried out for whatever reasons the waste must be disposed of effectively though some means. This may be the case for highly mixed wastes of oils, plastics, organic debris, water, sediments etc. which cannot be separated. |

The basis for such a Waste Management Plan will include a demonstration of:

- Temporary on-site waste storage:
    - Care will be taken in the selecting a location for a temporary waste handling base to allow for waste separation. Local authorities and waste management contractors will be consulted regarding the selection of suitable disposal routes, local regulations and may provide local facilities.
- Segregation of waste:
    - Wherever possible, wastes will be segregated in accordance with the preferred segregation. It may be required to separate oil from associated water, sediment, and debris, in order to minimise volumes. It is preferable that this is not attempted on the spill site.
- Onsite handling:

  - Attention will be given to the prevention of leaching or spillage of oil from vehicles or containers. Onsite handling equipment is available via MAC, Dampier Port Authority, WA DoT OSRC, AMOSC or AMSA.
- Offsite transport and storage:
  - Only State licensed waste contractors will be used. Care will be taken that all vessels, vehicles, or containers used for the transport of oily wastes are effectively sealed and leak-proof.
- Waste treatment and disposal options:
  - The disposal method most appropriate in an incident will depend on several factors, including the nature and consistency of the waste, the availability of suitable sites and facilities, the costs involved, as well as regulatory restrictions.
- Waste separation:
  - Waste separation is usually undertaken offsite at a designated waste processing area.
- Disposal:
  - Waste must be disposed of in accordance with WA regulations.
- Establishing a field decontamination facility:
  - The size and complexity of field decontamination facilities required will depend on the character of the oil and on the scale and nature of the clean-up being implemented.

*Monitoring and Reporting of Waste*

The Onshore Materials Logistics Co-ordinator will be responsible for maintaining a Waste Management Register for all waste generated from the shoreline response strategy. The designated Waste Contractor will monitor measure and record all waste streams that are disposed of onshore.

Measurement as required by Waste Contractor Conditions, including without limitation:

- Types of waste collected (e.g., liquid oily waste);
- Quantities of types of wastes collected (e.g., tonnes, litre);
- Destination of waste collated (named authorised disposal facility);
- Method of waste disposal (e.g., landfill, recycling); and
- Quantity of recyclable waste by type.

The Materials and Logistics Supervisor shall ensure that adequate waste disposal records are being maintained by the Waste Contractor, and that the Waste Reference Number for all waste is communicated to the Onshore Materials Logistics Coordinator for updating the Waste Management Register once waste is disposed.

**Potential Environmental Impacts and Risks – Oil Contaminated Waste Management**

Potential impacts from oil contaminated waste include secondary oiling of fauna, ground and water contamination.

**Response Arrangements – Oil Contaminated Waste Management**

In the event that shoreline contact was made and as part of Shoreline Clean-up, BHP will use Veolia (North West Waste Alliance) who are capable of collection, transport, treatment, and disposal of oil wastes generated by a large-scale emergency response situation.

**Response Timing – Oil Contaminated Waste Management**

Waste Management arrangements will be timed to ensure oil contaminated waste from marine recovery and / or shoreline clean-up operations can be appropriately handled, stored, and transported.

**Legislative and Other Considerations – Oil Contaminated Waste Management**

Waste management reporting will comply with the following reporting requirements:

- Environmental Protection (Controlled Waste) Regulations 2004;
- BHP Our Requirements HSEC Reporting;
- National Pollutant Inventory annual reporting of emissions and discharges relating to resource consumption e.g., waste effluent; and
- In addition to reporting all waste generated from a spill event, it will also be tracked upon mobilisation of the waste contractor using the Controlled Waste Tracking System (CWTS). This is an online user system provided by DBCA to enable the electronic tracking of controlled waste loads across the State. Upon request DBCA generates user profiles that enable access to components of the CWTS that are specific to waste generators, carriers and/or waste disposal sites (treatment plants) and enable them to complete their statutory obligations online.

**ALARP Evaluation – Oil Contaminated Waste Management**

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| **Eliminate** | Negative environmental impact from the execution of this response strategy. | No waste management | Do nothing option | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | No environmental benefit would be gained from this option; experience from past oil spills suggests that environmental sensitivities can be protected effectively when waste management operations are activated. | Waste management is practicable, and the do-nothing option is not considered within the external context (e.g., stakeholder views) to be a viable option. | **Reject:** Waste management is a recognised strategy for the mitigation of oil spill impacts. |
| **Administrate** | Response strategy executed adhoc with no real planning leading to ineffective response. | Waste management operations reviewed and managed by IMT through Incident Action Plan (IAP) process. | Within the first 24 hours, the BHP IMT will develop IAPs. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of waste management operations will take place almost immediately in the event of a Level 3 spill. The waste management operations would be adapted based on real-time information regarding the spill incident. | Controls have effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications. | **Accept**: Controls are practicable, and the cost sacrifice is not disproportionate to the environmental benefit gained. |
| | Response activities not considered in preparedness planning therefore not allowing for input into the Operational SIMA. | Operational SIMA to include evaluation of requirement for implementation of waste management operations. | The waste management response strategy will be activated to prevent environmental impacts to sensitive environmental receptors. | N/A | N/A | 0-2 hours | Minor | H | H | H | H | H | Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational SIMA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather, and sea state conditions etc.) to confirm the | | |

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | | | | | | appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Waste management will be activated to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors. | | |
| | No access to suitable specialised equipment in reasonable timeframes. | Mobilisation of equipment and personnel to conduct waste management response within 24 hours of notification by IMT following outcomes of first IAP and maintained regularly in IAP outcomes. | Timely implementation of waste management plan and contractor. | N/A | N/A | Within 24 hours of formation of IMT | Minor | H | H | H | H | H | Positive environmental benefit gained from rapid response of waste management plant, equipment, and resources from Dampier / Karratha. | | |
| | Recovered waste is not handled or managed effectively or efficiently further impacting the environment. | Crude oil waste retrieved to be managed in accordance with the Waste Management Plan. | Ensures waste management policies and procedures are being followed. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from rapid response of waste management plant, equipment, and resources from Dampier / Karratha. | | |
| | Poor understanding of the effectiveness of waste management and its impact on the environment. | Implement environmental monitoring to determine the ongoing acceptability of the environmental risk associated with waste management methods. | Environmental monitoring will be used to determine the effectiveness of waste management controls and techniques for removing waste oil from site. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from environmental monitoring in understanding the effectiveness of waste management controls and techniques for removing waste oil from site. Outcomes of environmental monitoring will be used to inform waste management response strategy through the IAP's. | | |
| | Response activities impacting areas of cultural significance. | Waste management operations will avoid cultural | Increases the potential that impacts to sensitive receptors will be | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained by taking into consideration any | | |

PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | heritage sensitivities. | prevented by avoiding areas of known cultural heritage significance. | | | | | | | | | | advice from State government agencies and spatial information to avoid impacts to cultural heritage sensitivities. | | |
| | Response continues with no end point or is removed early. | Response strategy activities continued until termination criteria met. | The waste management response strategy will continue to prevent environmental impacts to sensitive environmental receptors until the performance outcome has been achieved. | N/A | N/A | N/A | Minor | H | H | H | H | H | Positive environmental benefit gained from ensuring that the waste management response strategy continues until the performance outcome has been achieved. | | |
| **Administrate** | No access to suitable specialised equipment in reasonable timeframes. | Access to waste management plant and equipment in place during operations. | Enables rapid response of waste management resources from Dampier / Karratha. | Large | Veolia / NWWA | N/A | Moderate | H | H | H | H | H | Positive environmental benefit gained from implementation of this control measure. The objective of waste management is to prevent impacts to sensitive receptors by the removal of oiled waste from site. | Control has High effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for operations but moderate to major costs if implemented. | **Accept**: Control is practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |
| **Administrate** | No access to suitable specialised equipment in reasonable timeframes. | Access to more waste management plant and equipment. | Acquisition of more waste management plant and equipment from Perth and around Australia. | Small | As required | 10 | Moderate | H | H | H | H | H | The environmental benefit associated with waste management is considered to be significant, which has the potential to reduce the environmental severity from a Material Risk rating of 5 (serious or extensive impacts <20 years) to a Non-Material Risk rating of 4 (major impacts <5 years).<br><br>Scalable options involve accessing more plant and equipment from Perth and if needed around Australia. | This control is effective and the cost of acquiring more plant equipment from Perth and around Australia would potentially have moderate cost implications. Cost during activation would be major. | **Accept**: Controls are practicable, and the cost sacrifice is not grossly disproportionate to the environmental benefit gained. |

## PYRENEES PHASE 4 BASIS OF DESIGN AND FIELD CAPABILITY ASSESSMENT

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Effectiveness (L/M/H) | | | | | | | |
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time | Cost | Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | Response strategy executed adhoc with no real planning leading to ineffective response. | Pre-position temporary waste storage locations along most likely area for oil to come ashore (Cape Range National Park). | Build temporary waste storage locations along Cape Range National park to enable rapid collection of oil following shoreline contact. | Large | Veolia / NWWA, Transpacific and Toxfree (if required) | Up to 35 days | Moderate | H | L | L | H | H | The environment benefit gained with temporary storage is once oily waste is collected it allows effective waste management to continue and not hinder recovery operations because the necessary permits/approvals are in place for temporary storage, treatment, and disposal of oily waste.<br><br>The only limitation is logistics such as traffic, waste collection and processing time associated with temporary storage/treatment and final disposal options.<br><br>However, with spill contact location spanning the Ningaloo Coast, the selection and construction of a temporary waste storage facility prior to a spill event could preclude the response from making most of more suitable (closer) temporary or existing storage locations, place unnecessary pressure on regional infrastructure/ roads and clean-up logistics from waste recovery to temporary disposal location, and is unable to make most of IAP process and accepted Administrative Control Measure.<br><br>Cost to build and | Temporary storage disposal locations will vary depending on the concentrations of contaminates and location ashore.<br><br>The control has High availability. BHP has equipment/resources in place for project managing the selection, construction and operation temporary storage sites, however, significant resource requirements are required for the following activities to be complete:<br>- Temporary storage site suitability assessment under advice from the Local Council/WALGA and DER.<br>- Select most suitable sites.<br>- Obtain site owner approval and necessary licensing requirements and permits.<br>- Construct site with engineer contractor and waste contractor<br>- Select storage options, implement traffic management, set up waste reception area;<br>- Establish system to track types, quantities and movements of waste into and out of temporary storage site including volumes recovered and type, segregation streams, storage locations, transport and disposal.<br>- Create bunded areas for waste lay down and method to control capacity of the bunds (pumps, valves)<br>- Construct truck transfer designated area (hard stand or bunded area)<br>- Implement appropriate decontamination procedures for personnel and equipment before leaving work area.<br><br>The control has low functionality and low reliability; implementation of the control measure does not greatly reduce the risk/impact of oil on shore, and the control has not been tried and tested in Australian waters for another oil and gas project.<br><br>The control has High | **Reject:**<br>Construction of temporary storage area prior to spill event is not a recognised strategy for the mitigation of oil spill impacts. Worst possible volumes ashore and associated waste volumes can be managed with existing infrastructure and arrangements. |

| Controls | | | | ALARP Evaluation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Function | Risk | Control Measure | Rationale | Response Capacity | Units | Implementation Time | Cost | Effectiveness (L/M/H) Availability | Functionality | Reliability | Survivability | Independence / Compatibility | Environmental Benefit Gained | Practicability / Constraints | ALARP Summary |
| | | | | | | | | | | | | | operate would be Moderate to Major. | survivability and High independence/compatibility; implementation has a High operating timeframe and will not need to be replaced regularly; the control can be implemented in unison with accepted Administrative Control Measures. | |

**Response Preparedness Performance Standards – Oil Contaminated Waste Management**

| Spill Response Preparedness – Oil Contaminated Waste Management | | | |
|---|---|---|---|
| **Environmental Performance Outcome** | **BHP prepared to respond to a potential WCD scenario in an effective and timely manner** | | |
| **Control Measure** | **Environmental Performance Standard** | **Measurement Criteria** | **Responsibility** |
| Service Contract | BHP shall have a contract in place with a Waste Management Contractor with regional capacity to manage oil contaminated wastes. | Service Level Agreement | APU Operations Manager |

**Demonstration of Acceptability – Oil Contaminated Waste Management**

- A detailed ALARP evaluation has been undertaken including an assessment of alternate and improved options and BHP has adopted an approach to undertake waste management in the shortest reasonably practical timeframes; and
- Given the preparedness measures detailed within this section, BHP consider the Environmental Performance Outcome of 'BHP prepared to respond to a potential WCD scenario in an effective and timely manner' will be achieved.

## 7.3 Tiered Preparedness Wheel (LOWC – Stickle Crude)

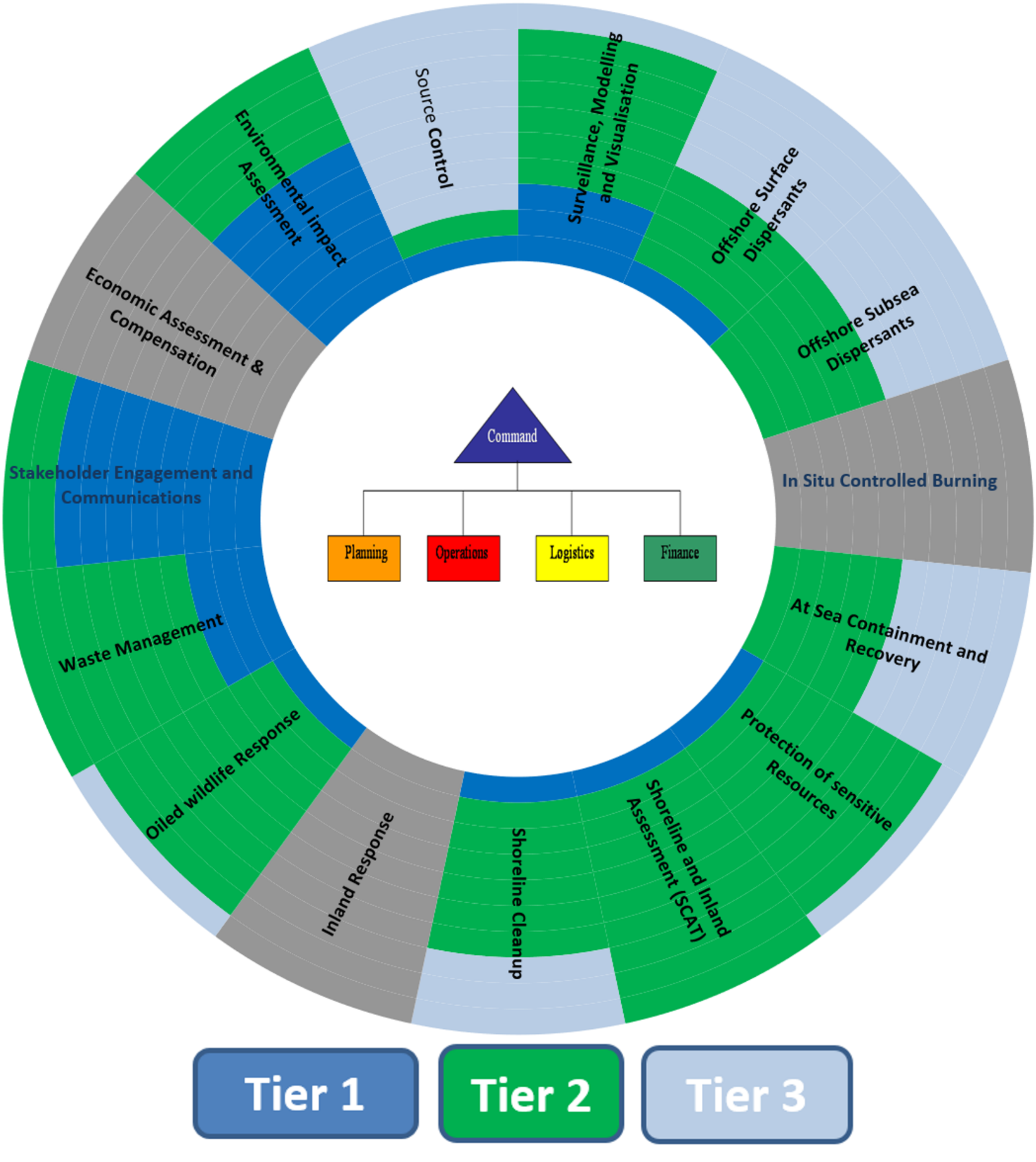


Figure 7-2: Tiered preparedness wheel – Pyrenees LOWC (crude)

# 8 Environmental Impact and Risk Assessment

The purpose of this section is to address the requirements of Regulations 13(5) and 13(6) in relation to the evaluation of all the identified impacts and risks associated with the implementation of response strategies and the mitigative control measures that will be applied to reduce the potential environmental impacts and risks to ALARP and an acceptable level.

While spill response activities are intended to reduce the potential environmental consequences of a hydrocarbon spill, they can introduce new impacts and risks. In the event of a hydrocarbon spill, response strategies will be implemented where possible to reduce environmental impacts and risks to ALARP. The response strategies deemed appropriate based on the predicted nature and scale of the worst-case spill scenarios identified for the Pyrenees Phase 4 Infill Drilling Program have been identified (via the preliminary SIMA) (refer to previous Section 5).

## 8.1 Offshore Response Operations

Offshore response strategies that occur in offshore locations via either vessel or MODU (with the exception of chemical dispersant application) are undertaken in a manner consistent with routine operations described within the *Pyrenees Phase 4 Infill Drilling Program EP* (BHPB-04PY-N950-0021). As such, the environmental aspects, impacts and risks that may arise from conducting spill response activities in offshore locations are similar to those already described in Sections 7 and 8 of the EP. Table 8-1 provides a summary of these potential impacts and risks and the control measures and corresponding Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria (MC) that apply whilst undertaking spill response operations in offshore waters.

Potential environmental impacts and risks and mitigative control measures associated with specific response strategies undertaken nearshore and shoreline response strategies are presented within subsequent sections. Impacts and risks associated with chemical dispersant application are detailed in Appendix B – Dispersant Application Risk Assessment.

**Table 8-1: Summary of general impacts and risks associated with offshore operations**

| Summary of potential impacts associated with offshore response strategies as per Pyrenees Phase 4 Infill Drilling Program EP | | | | | | | | Relevant Section of Pyrenees Phase 4 Infill Drilling Program EP | |
|---|---|---|---|---|---|---|---|---|---|
| **Aspect** | **Source of Risk** | **Potential Impact** | **Severity Factor** | **Likelihood Factor** | **Residual Risk** | **Decision Context** | **Acceptability** | **Applicable Control Measures** | **Applicable EPOs / EPSs / MC** |
| Physical presence | Presence of the MODU and AHTS vessels and timing of the activity. | Interference with or displacement of other marine users (e.g., commercial shipping, commercial fishing and/ or other third-party vessels). | 10 | N/A | - | Type A<br>Low Order Impact | Tolerable | Table 7-2 | Table 9-1 |
| Benthic habitat disturbance | Anchor placement within 2 km of well centre. | Benthic habitat and biota disturbance | 10 | N/A | - | Type A<br>Low Order Impact | Tolerable | Table 7-3 | Table 9-2 |

| Summary of potential impacts associated with offshore response strategies as per Pyrenees Phase 4 Infill Drilling Program EP | | | | | | | | Relevant Section of Pyrenees Phase 4 Infill Drilling Program EP | |
|---|---|---|---|---|---|---|---|---|---|
| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Applicable Control Measures | Applicable EPOs / EPSs / MC |
| Light emissions | Artificial light on-board MODU and AHTS vessels | Light emissions (light spill/ glow) from external lighting causing behavioural alterations in protected species including displacement from foraging areas. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | Table 7-4 | N/A |
| Noise emissions | Generation of underwater noise from the MODU and AHTS vessels during routine operations. | Underwater sound emitted to the marine environment causing interference to marine mammals. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | Table 7-8 | Table 9-3 |
| | Generation of noise from helicopter operations. | Sound emitted to the marine environment causing interference to marine mammals. | | | | | | | |
| Atmospheric emissions | Exhaust emissions of particulates and volatile organic compounds (VOCs) from MODU & AHTS vessels engines and generators & AHTS vessel incinerators. | Localised and temporary reduction in ambient air quality resulting in harm avian fauna. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | Table 7-11 | Table 9-4 |
| Routine MODU & AHTS vessel discharges within operational area | Routine planned discharge of sewage, grey water, putrescible (food), desalination brine, cooling water, and deck and bilge water to the marine environment from the MODU & | Localised and temporary reduction in water quality adjacent to the discharge point associated with minor increases in nutrients, salinity, temperature, and oily water/ chemical residues. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | Table 7-13 | Table 9-5 |

| Summary of potential impacts associated with offshore response strategies as per Pyrenees Phase 4 Infill Drilling Program EP | | | | | | | | Relevant Section of Pyrenees Phase 4 Infill Drilling Program EP | |
|---|---|---|---|---|---|---|---|---|---|
| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Applicable Control Measures | Applicable EPOs / EPSs / MC |
| | AHTS vessels. | | | | | | | | |
| | Discharge of BOP control fluids or other chemicals such as hydraulic fluids and greases (and well kill brine as contingency). | Localised and temporary reduction in water quality adjacent to the discharge point associated with hydrocarbon and chemical contaminants causing adverse toxicity effects. | 10 | N/A | - | | Tolerable | | |
| Discharge of drill cuttings | WBM cuttings discharged overboard or to seabed. | Localised changes in turbidity, altered physical characteristics of sediment. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | | |
| | Cuttings contamination with reservoir hydrocarbon. | Localised, short-term changes in water quality and toxicity at the surface due to cuttings discharge. | 10 | NA | - | | Tolerable | | |
| Discharge of water-based drill fluids | WBM fluid discharged overboard into water column. | Localised and temporary reduction in water quality adjacent to the discharge point associated with minor increases in turbidity. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | | |
| | | Potential acute/chronic toxicity to marine biota, accumulation of heavy metals in sediments. | 10 | N/A | - | | Tolerable | | |
| Discharge of cement during drilling activities | Cement residue from flushing of pipework and cement unit/ tank after each cement job. | Localised, short-term changes in water quality and toxicity at the surface due to cement discharge. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | | |
| | Mixed cement and/ or cement additives mixed for use but not subsequently used | Localised loss of biota from smothering. | 10 | NA | - | | Tolerable | | |

| Summary of potential impacts associated with offshore response strategies as per Pyrenees Phase 4 Infill Drilling Program EP | | | | | | | | Relevant Section of Pyrenees Phase 4 Infill Drilling Program EP | |
|---|---|---|---|---|---|---|---|---|---|
| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Applicable Control Measures | Applicable EPOs / EPSs / MC |
| | discharged overboard. | | | | | | | | |
| Waste management | Waste (hazardous and non-hazardous) generated during activities. | Increase waste to landfill. Additional usage of onshore waste reception facilities. | 10 | N/A | - | Type A<br><br>Low Order Impact | Tolerable | Table 7-14 | Table 9-6 |
| Interaction with marine fauna | Accidental collision between AHTS vessel and marine fauna. | Potential lethal impact or injury to protected marine species. | 10 | Highly Unlikely (0.03) | 0.3 | Type A<br><br>Lower Order Risk | Tolerable | Table 8-25 | Table 9-12 |
| Introduced marine species | Movement of vessel and immersible equipment from known high invasive marine species risk areas. | Introduction of invasive marine species to area leading to major impact to native species. | 100 | Highly Unlikely (0.03) | 3 | Type A<br><br>Low Order Risk | Tolerable | Table 8-28 | Table 9-13 |
| Fauna handling / interaction | Oiled Wildlife Response – unintended impacts associated with poorly implemented hazing, capture, clean & rehabilitation. Poor animal welfare / husbandry practices. | Secondary disturbance causing behavioural alterations in protected species including displacement from foraging and nursing areas.<br><br>Inadvertent oiling or re-oiling of individuals.<br><br>Individuals may become unnecessarily stressed and disease may be introduced into wild populations. | 30 | Unlikely (0.1) | 3 | Type A<br><br>Low Order Risk | Tolerable | RS-CM-06 | Refer OPEP |

## 8.2 Nearshore Response Operations

Table 8-2 provides a summary of potential impacts and risks relate to response strategies undertaken in nearshore environments via vessel or light aircraft, with the exception of chemical dispersant application, which is detailed within Appendix B – Dispersant Application Risk Assessment.

**Table 8-2: Summary of potential impacts and risks associated with nearshore response**

| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Mitigative Control Measure |
|---|---|---|---|---|---|---|---|---|
| Physical presence | Presence of response vessels in nearshore location. | Interference with or displacement of other marine users in nearshore locations (e.g., recreational fishers). | 10 | N/A | - | Type A<br>Low Order Impact | Tolerable | RS-CM-01 |
| | Accidental collision between response vessel and marine fauna. | Potential lethal impact or injury to protected marine species. | 10 | Highly Unlikely (0.03) | 0.3 | Type A<br>Lower Order Risk | Tolerable | RS-CM-03 |
| Benthic habitat disturbance | Mooring of response vessels in nearshore environments. | Benthic habitat and biota disturbance. | 10 | N/A | - | Type A<br>Low Order Impact | Tolerable | RS-CM-02 |
| Light emissions | Artificial light on-board response vessels. | Light emissions (light spill/ glow) from external lighting causing behavioural alterations in protected species including displacement from foraging, nursing, and nesting areas. | 10 | N/A | - | Type A<br>Low Order Impact | Tolerable | RS-CM-03 |
| Noise Emissions | Generation of underwater noise response vessels in nearshore environments. | Underwater sound emitted to the marine environment causing interference to marine mammals. | 10 | N/A | - | Type A<br>Low Order Impact | Tolerable | RS-CM-03 |
| | Noise from helicopter and aircraft operations in nearshore environments. | Sound emitted to the marine environment causing behavioural alterations in protected species including displacement from foraging, nursing, and nesting areas. | | | | | | RS-CM-04 |
| Vessel discharges | Discharge of sewage, grey water, putrescible (food) from response vessels | Reduced water quality impacting listed species. | 10 | Unlikely (0.1) | 1 | Type A | Tolerable | RS-CM-03 |

| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Mitigative Control Measure |
|---|---|---|---|---|---|---|---|---|
| | in nearshore environments. | | | | | Low Order Risk | | |
| Accidental release of solid objects overboard | Loss of solid waste or equipment overboard due to improper waste management or handling error. | Impacts to marine fauna (e.g., ingestion, entanglement) and seabed disturbance if object heavy enough to sink to the seabed. | 10 | Unlikely (0.1) | 1 | Type A<br><br>Lower Order Risk | Tolerable | RS-CM-03 |
| Introduced marine species | Response vessels mobilised from species risk areas / ballast water discharges. | Introduction of invasive marine species to area leading to major impact to native species in shallow benthic environments. | 100 | Highly Unlikely (0.03) | 3 | Type A<br><br>Low Order Risk | Tolerable | RS-CM-03<br>RS-CM-05 |
| Fauna handling / interaction | Oiled Wildlife Response – unintended impacts associated with poorly implemented hazing, capture, clean & rehabilitation. Poor animal welfare / husbandry practices. | Secondary disturbance causing behavioural alterations in protected species including displacement from foraging, nursing, and nesting areas.<br>Inadvertent oiling or re-oiling of individuals.<br>Individuals may become unnecessarily stressed and disease may be introduced into wild populations. | 30 | Unlikely (0.1) | 3 | Type A<br><br>Low Order Risk | Tolerable | RS-CM-06 |

### Mitigative Control Measures for Nearshore Response

Table 8-3 details the mitigative control measures applied to nearshore response operations. Refer to OPEP for corresponding Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria.

**Table 8-3: Control measures for nearshore operations**

| Control Measure Reference | Mitigative Control Measure |
|---|---|
| RS-CM-01 | Stakeholder engagement with potentially affected marine users prior to and during the implementation of response strategies. |
| RS-CM-02 | Contracting of shallow-bottom response vessels for near-shore operations (where practicable). |
| RS-CM-03 | Project induction for Vessel Masters covering:<br>• EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans (modified to include whale sharks and turtles*);<br>• Hazards to nearshore benthic environments due to mooring activities; |

| | |
|---|---|
| | • Hazards associated with artificial lighting and overview of National Light Pollution Guidelines (DoEE, 2020) and light reduction measures for night-time operations;<br>• Speed limitations in nearshore environments to reduce engine noise;<br>• Overview of Marine Order 91 (Pollution Prevention – Oil), Marine Order 94 (Pollution Prevention – Packaged Harmful Substances), Marine Order 95 (Pollution Prevention – Garbage) and Marine Order 96 (Pollution Prevention – Sewage);<br>• Waste containment measures for small vessels and onshore waste disposal options;<br>• An overview of Australian Ballast Water Management Requirements (Rev 8); and<br>• Hazards associated with the introduction of invasive species to offshore island habitats. |
| RS-CM-04 | Aircraft operators informed of potential impacts to nearshore environments and 'no fly' zones if established. |
| RS-CM-05 | All response vessels subject to BHP Introduced Marine Species Risk Assessment and Approval Procedure (AOHSE-E-0018-001). |
| RS-CM-06.1 | Oiled Wildlife Response undertaken in manner consistent with the Western Australian Oiled Wildlife Response Plan (2014) and under the direction of Department of Biodiversity, Conservation and Attractions (DBCA) in State jurisdiction and the NatPlan in Commonwealth waters under the direction of Department of Agriculture, Water, and the Environment (DAWE) in Commonwealth jurisdiction. |

## 8.3 Shoreline Response Operations

Table 8-4 provides a summary of potential impacts and risks relate to response strategies undertaken on shorelines.

**Table 8-4: Summary of potential impacts and risks associated with shoreline response**

| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Mitigative Control Measure |
|---|---|---|---|---|---|---|---|---|
| Physical presence | Presence of response personnel and equipment on shorelines. | Displacement of people / communities from shoreline locations (e.g., amenity beaches). | 10 | N/A | - | Type A<br>Low Order Impact | Tolerable | RS-CM-07<br>RS-CM-09 |
| | | Disturbance to shoreline habitat and biota (e.g., EPBC listed, migratory, threatened species).<br>Potential to disturb turtle nest and turtle nesting activities. | 10 | Unlikely (0.1) | 1 | Type A<br>Low Order Risk | Tolerable | RS-CM-08<br>RS-CM-09 |
| | | Disturbance / damage to site Aboriginal heritage sites. | 100 | Highly Unlikely (0.03) | 3 | Type A<br>Low Order Risk | Tolerable | RS-CM-16<br>RS-CM-09 |
| Light emissions | Artificial light from forward operating bases. | Light emissions (light spill/ glow) from external lighting causing behavioural alterations in protected species including displacement from foraging, nursing, and nesting areas (e.g., turtle nesting and hatching). | 10 | Unlikely (0.1) | 1 | Type A<br>Low Order Risk | Tolerable | RS-CM-11<br>RS-CM-12 |
| Noise emissions | Noise from shoreline clean-up equipment / machinery. | Noise causing behavioural alterations in protected species including displacement from foraging, nursing, and nesting areas. | 10 | Unlikely (0.1) | 1 | Type A<br>Low Order Risk | Tolerable | RS-CM-11 |
| Waste Management | Incorrect management of hydrocarbon-contaminated wastes. | Additional contamination of the shoreline not directly exposed to original hazard. | 10 | Unlikely (0.1) | 1 | Type A<br>Low Order Risk | Tolerable | RS-CM-11<br>RS-CM-12<br>RS-CM-13 |
| Introduced terrestrial species | Response vessels, personnel and | Introduction of invasive species (namely rodents) to offshore islands leading | 100 | Highly Unlikely (0.03) | 3 | Type A | Tolerable | RS-CM-05 |

| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Mitigative Control Measure |
|---|---|---|---|---|---|---|---|---|
| | equipment landing on shorelines | to major impact to native species. | | | | Low Order Risk | | RS-CM-14 |
| Fauna handling / interaction | Oiled Wildlife Response – unintended impacts associated with poorly implemented hazing, capture, clean & rehabilitation. Poor animal welfare / husbandry practices. | Secondary disturbance causing behavioural alterations in protected species including displacement from foraging, nursing, and nesting areas.<br>Inadvertent oiling or re-oiling of individuals.<br>Individuals may become unnecessarily stressed and disease may be introduced into wild populations. | 30 | Unlikely (0.1) | 3 | Type A<br><br>Low Order Risk | Tolerable | RS-CM-06 |

### Identification of environmentally sensitive shoreline types

Environmentally sensitive shorelines, cultural heritage sites and shoreline receptors that may be impacted by a potential oil spill is a key consideration in determining priorities for shoreline response and clean-up activities. Whilst the WA DoT is ultimately responsible for determining protection priorities, this section outlines considerations to inform the identification of shore-based oil spill response and clean-up priorities in the event of spill incidents. Table 8-5 identifies protection and clean-up options. Table 8-6 outlines the sensitivity of coastal features, and appropriate protection and clean-up options given the sensitivities and features. Table 8-7 provides an environmental risk assessment of the identified protective measures and preferred clean-up methods. The outcomes from Table 8-7, in consultation with the WA DoT, may be used to inform the Operational SIMA and subsequent IAP.

**Table 8-5: Protection and clean-up options**

| | |
|---|---|
| 1. Containment and recovery using booms | 8. Manual clean-up of oil, or movement of substratum |
| 2. Divert to less sensitive shore | 9. Low pressure seawater flushing |
| 3. Man-made sorbent methods | 10. High pressure flushing |
| 4. Earth barriers | 11. Hot water steam cleaning |
| 5. Chemical dispersant | 12. Low pressure warm seawater wash |
| 6. Skimmers, vacuums | 13. Mechanical clean-up of oil, removal, or movement of substrate |
| 7. Natural recovery, allow to weather naturally | 14. Bioremediation |

**Table 8-6: Coastal features classification: sensitivity, protection and clean-up methods**

| Coastal Feature | Sensitivity * | Comments | Protective Measure | Clean-up Method | | |
|---|---|---|---|---|---|---|
| | | | | Preferred | Possible | Avoid |
| Sites of Cultural Significance | S1 | Potential damage to Aboriginal registered sites of cultural significance from shoreline clean-up activities and shoreline response operations. | 2, 3 | 1, 7 | 6, 14 | 5, 8, 9, 10, 11, 12,13 |
| Mangroves & Tidal Flats | S1 | Extremely low energy areas. Oils may penetrate muddy substrate rapidly and deeply and can persist for years.<br><br>Associated tidal flats are very important for wading birds. These areas should receive top protection and clean-up priority. | 2, 3 | 1, 7 | 3, 6, 14 | 5, 8, 9, 10, 11, 12,13 |
| Intertidal Limestone Reef & Corals | S2 | Unless tide is low, most corals will not be directly exposed to floating oil. However, turbulent mixing from waves can result in contact and adhesion of oil to reef areas. | 1, 2, 3, 4 | 1, 3, 7 | 8 | 5, 6, 9, 10, 14 |
| Sandy Beaches | S3<br>S1* | Sand beaches are relatively low in ecological diversity except during times of turtle and bird nesting. Higher clean-up priority should be given to turtle nesting and amenity beaches. High potential for oil penetration. | 1, 3 | 1, 3, 6, 7, 8, 13 | 9, 14 | 5, 10, 11 |
| Sheltered Rock Shores | S3 | Landed oil will weather quickly and may accumulate in pools and cracks. | 1, 3 | 7 | 3, 8, 9 | 5,10,11 |
| Shingle, Rock and Sand Mixed Beaches | S4 | High potential for oil penetration and persistence. | 1, 3 | 7, 9 | 8, 14 | 5, 10, 11, 12 |
| Exposed Rock<br><br>Shores and Cliffs | S4 | Wave reflection may keep oil offshore. Moderate diversity and organisation quickly. Oil will accumulate in tidal pools and cracks. | | 7 | 1, 3, 9, 12 | 5, 10, 11 |
| Marina, Jetties, Piers | S4 | Very low likelihood of marina or pier areas being affected. To be cleaned as circumstances dictate. | 1, 3 | 1, 3, 6, 9, 10 | 11, 12 | 5 |

***Sensitivity Codes:***

S1: Extreme Sensitivity: High Protection and clean-up priority
S2: High Sensitivity: Protection and clean-up priority as resource use & circumstances dictate
S3: Moderate Sensitivity: Protection and clean-up priority as resource use and circumstances dictate
S4: Low Sensitivity Low protection and clean-up priority
*Sandy beaches have an extreme sensitivity during turtle and bird nesting, which occurs at a number of sandy beaches in the region.

**Table 8-7: Environmental risks of shoreline protective and preferred clean-up method**

| Protection and Clean-up Options Method Reference | Method | Environmental Risks | Likelihood Factor | Severity Factor | Residual Risk | Acceptability |
|---|---|---|---|---|---|---|
| 1 | Containment and recovery booms | • Wildlife entrainment, disturbance injury and entanglement during deployment and use of equipment and personnel; and<br>• Contamination of ground or surface water resulting from management of waste. | Unlikely (0.1) | 100 | 10 | Tolerable |
| 2 | Diversion to a less sensitive shoreline | • Contamination and accumulation of oil on the less sensitive shore; and<br>• Wildlife entrainment, disturbance, injury and entanglement during deployment and use of equipment. | Highly Likely (3) | 10 | 30 | Tolerable |
| 3<br>6 | Man-made sorbents<br>Skimmers and vacuums | • Contamination of ground or surface water resulting from management of waste; and<br>• Wildlife entrainment, disturbance injury and entanglement during deployment and use of equipment and personnel. | Unlikely (0.1) | 10 | 1 | Tolerable |
| 4<br>8 | Earth barriers<br>Manual clean-up and/or movement of substratum | • Ground and vegetation disturbance and/or compaction to sensitive coastal landforms through use of machinery and earth moving, resulting in erosion and potential sedimentation of surface water;<br>• Wildlife entrainment, disturbance, injury and entanglement during deployment and use of equipment and personnel; and<br>• Contamination of ground or surface water resulting from management of waste. | Likely (1) | 30 | 30 | Tolerable |
| 7 | Natural recovery, allow to weather naturally | • Prolonged and ongoing contamination and visible oil on both the shore and in the marine sediments and water column. | Highly Likely (3) | 100 | 300 | ALARP |
| 9<br>10 | Low pressure flushing<br>High pressure flushing | • Contamination of surface water with oily water;<br>• Drive oil deeper into substratum;<br>• Erosion of substratum; and<br>• Damage and/or death to sensitive shoreline flora and fauna via action of water, and deployment of equipment and personnel. | Likely (1) | 30 | 30 | Tolerable |
| 13 | Mechanical clean- up of oil, | • Vegetation clearing and damage, soil compaction; | Likely (1) | 30 | 30 | Tolerable |

| Protection and Clean-up Options Method Reference | Method | Environmental Risks | Likelihood Factor | Severity Factor | Residual Risk | Acceptability |
|---|---|---|---|---|---|---|
| | removal or movement of substrata | • Hydrocarbon leaks from equipment;<br>• Drive oil deeper into substratum;<br>• Erosion of substratum;<br>• Damage and/or death to sensitive shoreline flora and fauna via action of water, and deployment of equipment and personnel. | | | | |

### Mitigative Control Measures for Shoreline Response

Table 8-8 details the mitigative control measures that apply to shoreline response operations. Refer to OPEP for corresponding Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria.

**Table 8-8: Control measure for shoreline response**

| Control Measure Reference | Mitigative Control Measure |
|---|---|
| RS-CM-06.2 | Oiled Wildlife Response undertaken in a manner consistent with the Western Australian Oiled Wildlife Response Plan (2014) under the direction of Department of Biodiversity, Conservation and Attractions (DBCA). |
| RS-CM-07 | Stakeholder engagement with potentially affected shoreline amenity users prior to and during the implementation of response strategies |
| RS-CM-08 | SCAT implemented to identify vulnerable receptors potentially exposed to shoreline response operations. |
| RS-CM-09 | Demarcation of identified values and sensitivities to mitigate potential impacts from response personnel and equipment. |
| RS-CM-10 | Type and size of shoreline clean-up equipment appropriate for nature and scale of response operation and objective of IAP. |
| RS-CM-11 | Project induction for shoreline responders covering:<br>• Activity-specific controls;<br>• Overview of EPBC listed / threatened / migratory species and fauna handling requirements and reporting protocols;<br>• Hazards to shoreline environments due to response operations;<br>• Hazards associated with artificial lighting and overview of National Light Pollution Guidelines (DoEE, 2020) and light reduction measures for night-time operations;<br>• Oil contaminated waste containment and equipment cleaning measures; and<br>• Hazards associated with the introduction of invasive species to offshore island habitats. |
| RS-CM-12 | Forward Operating Bases located in coastal areas to consider lighting management in design / layout to limit light spill / glow to turtles nesting beaches. |
| RS-CM-13 | Waste Management Plan prepared and implemented in consultation with AMOSC and WA DoT inclusive of dedicated oil contaminated equipment cleaning areas. |
| RS-CM-14 | Visual inspections for exotic terrestrial species (pests) of vessels, helicopters, equipment, and personnel mobilising to offshore islands as part of any shoreline response activity. |

<table>
<tr><td>RS-CM-15</td><td>Operational SIMA undertaken in consultation with AMOSC and in agreement with WA DoT prior to development of shoreline response IAPs and implementation of response strategies in State jurisdiction. At a minimum, IAPs to consider:<ul><li>Responder HSE requirements;</li><li>Suitability of shoreline response strategies in relation to coastal features and potential environmental risks;</li><li>Management of personnel and equipment on turtle nesting beaches;</li><li>Potential impacts from night-time operations (light spill / glow) on listed species;</li><li>Potential disturbance to intertidal habitats from response operations;</li><li>Potential for introduction and establishment of invasive species</li></ul></td></tr>
<tr><td>RS-CM-16</td><td>Identification and protection of registered Aboriginal heritage sites in consultation with the Western Australian Department of Planning, Lands and Heritage.</td></tr>
</table>

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# Appendix A – Industry Response Equipment

AMOSC Australian Marine Oil Spill Centre Pty Ltd

# Industry Mutual Aid Equipment Register Updated 10/05/2021

| Company | Equipment | Type | Units | Location |
|---|---|---|---|---|
| BHP BILLITON as 13/05/2021 | | | | |
| BHP Billiton | Dispersant, Spray Systems | Auspray Dispersant system ASDS | 1 | Pyrenees FPSO |
| BHP Billiton | Dispersant, Spray Systems | Auspray Dispersant system ASDS | 1 | Dampier |
| BHP Billiton | Dispersant | Corexit 9527 | 1.2 m3 | Pyrenees FPSO |
| | | | | |
| Ampol as of 10/05/2021 | | | | |
| Ampol | Absorbent, Boom | Rubberiser Boom | 200 m | Lytton Refinery |
| Ampol | Boom, Nearshore | GP 800 Fence Boom | 180 m | Lytton Refinery |
| Ampol | Shoreline Cleanup equipment | Oil Spill shed | 1 unit | Lytton Refinery |
| Ampol | Vessel | 4.75 mtr Aluminium Runner about "Jabiru" | 1 unit | Lytton Refinery |
| Ampol | Vessel | 5.7 litre multicruiser "Mimi" | 1 unit | Lytton Refinery |
| Ampol | Vessel | 135hp Honda "Ocean Cruiser" | 1 unit | Lytton Refinery |
| Ampol | Skimmer, Multi Head | Versatech Multi Skimmer, Brush, drum, disc with all hydraulic hoses, oil transfer hose and diesel Hydraulic power pack deliver FIS | 1 Unit | Lytton Refinery |
| Ampol | Boom, Nearshore | Zoom Boom | 150m | Lytton Refinery |
| Ampol | Vessel | Seamac (Punt) | 1 units | Lytton Refinery |
| Ampol | Boom, OnShore | Beach guardian | 7 units | Lytton Refinery |
| Ampol | Boom, OnShore | Anchor Kits | 15 units | Lytton Refinery |
| | | | | |
| CHEVRON as of 23/11/2020 | | | | |
| Chevron | Boom, OnShore | AirBlower | 2 | BWI |
| Chevron | Temporary Storage | Canflex Open Top, Floating Collar Tank | 1 | BWI |
| Chevron | Boom, Nearshore | Current Buster 2 (plus air blower) | 1 | BWI |
| Chevron | Boom, Nearshore | Current buster 6 with boom vane (plus 2 x air blowers) | 1 | BWI |
| Chevron | Power Pack | Desmi Skimmer Power Pack/ Skimmer Hose Reel | 3 | BWI |
| Chevron | Shoreline Cleanup equipment | Diesel Powered Water pump for low pressure flushing system | 2 | BWI |
| Chevron | Boom, OnShore | Ex WA Oil Shore Guardian | 3 | BWI |
| Chevron | Boom, Nearshore | Ex WA Oil Zoom boom | 2 | BWI |
| Chevron | Temporary Storage | Fastank 2000 | 4 | BWI |
| Chevron | Tracking Buoys | iSphere tracking buoy | 1 | BWI |
| Chevron | Skimmer, Weir | Mini-Max Weir Skimmer Set | 2 | BWI |
| Chevron | Boom, Nearshore | NOFI Solid Floatation Boom Bags 350 EP | 2 | BWI |
| Chevron | Boom, Nearshore | NOFI towable boom bag | 2 | BWI |
| Chevron | Boom, Nearshore | Self Inflating Zooom Boom | 8 | BWI |
| Chevron | Boom, Nearshore | Self Inflating Zooom Boom | 10 | BWI |
| Chevron | Power Pack | Spate pump | 2 | BWI |
| Chevron | Skimmer, Brush | Terminator Skimmer | 3 | BWI |
| Chevron | Boom, Nearshore | Tidal Boom 500 (Shore sealing boom) | 9 | BWI |
| Chevron | Temporary Storage | Towable bladder canflex | 2 | BWI |

| | | | | |
|---|---|---|---|---|
| Chevron | Dispersant, Spray Systems | AFEDO nozzles spray system | 1 | Ashbuton North |
| Chevron | Dispersant | Slickgone EW dispersant | 5 | Ashbuton North |
| Chevron | Power Pack | Spate pump | 2 | Ashbuton North |
| Chevron | Tracking Buoys | iSphere tracking buoy | 1 | Ashbuton North |
| Chevron | Temporary Storage | Towable bladder (Canflex Series 1 'Sea Slug') | 1 | Ashbuton North |
| Chevron | Temporary Storage | Fastank 2000 | 1 | Ashbuton North |
| Chevron | Boom, Nearshore | Self Inflating Zooom Boom | 6 | Ashbuton North |
| Chevron | Boom, Nearshore | Current Buster 2 in 10ft container | 1 | Ashbuton North |
| Chevron | Skimmer, Brush | Terminator in 10ft container | 1 | Ashbuton North |
| Chevron | Skimmer, Vacumm | Manta Ray skimmer | 2 | Ashbuton North |
| Chevron | Temporary Storage | Fastank 2000 | 15 | Ashbuton North |
| Chevron | Boom, Nearshore | NOFI Boom Bag 350EP | 1 | Ashbuton North |
| Chevron | Boom, Nearshore | Self Inflating Boom in container (Canadyne) | 2 | Ashbuton North |
| Chevron | Temporary Storage | Fastank 10000 | 4 | Ashbuton North |
| Chevron | Skimmer, Brush | Terminator | 125tph | Karratha |
| Chevron | Boom, Offshore | Norlense NO-1000-R | 300 | BWI |
| Chevron | Boom, Offshore | Norlense NO-1000-R | 300 | BWI |
| Chevron | Dispersant, Spray Systems | AFEDO nozzles spray system | 1 | Karratha |
| Chevron | Dispersant | Slickgone EW dispersant | 5 | Karratha |
| Chevron | Boom, Nearshore | Current buster 4 with boom vane | 1 | Karratha |
| | | | | |
| CONOCO PHILLIPS as of 10/05/2020 | | | | |
| Conoco Phillips | Tracking Buoys | Pathfinder Tracking Buoy | 2 units | FSO Liberdade- Timor Sea |
| Conoco Phillips | Absorbent, Boom | Absorbent, Boom | 400m | Darwin LNG Facility |
| | | | | |
| ESSO as of 02/06/2021 | | | | |
| Esso | Temporary Storage | Aluminium Skips (3m x 2m x 600mm High) | 12 unit | LIP |
| Esso | Vessel | Sperm Whale for nearshore response. (F.Y.I. to transport this vessel a tilt tray or Semi would be required & is potentially oversized load due to width of vessel and cradle) | 1 | BBMT |
| Esso | Dispersant | AFEDO dispersant spray systems | 2 | BBMT |
| Esso | Dispersant | Corexit 9500 | 30 m3 | BBMT |
| Esso | Boom, Nearshore | Expandi 3000 Harbour Boom | 300m | BBMT |
| Esso | Boom, Nearshore | Sea Sentinel (Can be used Offshore, ASTM connectors) | 2000m | LIP |
| Esso | Trailer | Beach/shoreline cleanup trailers | x4 | LIP x 2, BBMT x 1, Sale x 1 |
| Esso | Trailer | Decontamination Trailer | x1 | LIP |
| Esso | Dispersant, Spray Systems | Vikospray Dispersant System, Boat Spray Booms (pressure wands) & pump | X1 | LIP |
| Esso | Boom, Nearshore | Shoreboom | 750m | LIP |
| | | | | |
| Inpex as of 11/05/2021 | | | | |
| INPEX | Boom, Nearshore | 400m zoom-boom in deployment trailer, plus ancillaries, (towing bridles, ship hull magnets, 6 x anchor kits etc) | 1 | Bhagwan Darwin Marine Logistics Base – East Arm (Darwin Harbour) |
| INPEX | Skimmer, Weir | Desmi Termite Weir Skimmer (with brush skimmer adaptor) | 1 | ASCO Marine Supply Base – East Arm (Darwin Harbour) |
| INPEX | Skimmer, Weir | (Skimmer) Action Hydraulics Power Pack and ancillaries (hydraulic hoses etc) | 1 | ASCO Marine Supply Base – East Arm (Darwin Harbour) |

| | | | | |
|---|---|---|---|---|
| INPEX | Temporary Storage | 25m3 towable oil storage bladder | 2 | ASCO Marine Supply Base – East Arm (Darwin Harbour) |
| INPEX | Oil Transfer Equipment | Desmi DOP 200 Offloading Pump | 1 | ASCO Marine Supply Base – East Arm (Darwin Harbour) |
| INPEX | Oil Transfer Equipment | 20m oil transfer hoses on reel | 1 | ASCO Marine Supply Base – East Arm (Darwin Harbour) |
| INPEX | Dispersant | IsoTank 8000Lt Dasic Slick Gone NS Dispersant (MSDS attached) | 2 | Ichthys Venturer FPSO – Ichthys Field |
| INPEX | Dispersant, Spray Systems | AFEDO Spray System | 1 | Ichthys Venturer FPSO – Ichthys Field |
| INPEX | Tracking Buoys | RPS MetOcean Drifter (ARGOS satellite system) | 10 | Darwin (INPEX Offshore Logistics Base)<br>Broome (INPEX Drilling Logistics Base)<br>Ichthys Field (CPF, FPSO and various vessels) |
| | | | | |
| Jadestone current as of 18/05/2021 | | | | |
| Jadestone | Boom, Offshore | Offshore Boom | 2 | Darwin |
| Jadestone | Skimmer, Brush | Brush Skimmer | 2 | Darwin |
| Jadestone | Temporary Storage | 11 Te. Collapsible Storage Tank | 4 | Darwin |
| Jadestone | Temporary Storage | 50 Te. Deck Tank | 2 | Darwin |
| Jadestone | Dispersant | Dasic Slickgone NS Dispersant (1000lt IBC) | 8 | Darwin |
| Jadestone | Dispersant, Spray System | AFEDO 100D Dispersant Spray System | 1 | Darwin |
| Jadestone | Tracking Buoy | iSphere Tracking Buoy | 1 | Darwin |
| Jadestone | Dispersant, Spray System | Dispersant Spray System (Type) | 2 | Darwin |
| Jadestone | Skimmer, Wier | Lamor LWS500 Wier Skimmer | 1 | Darwin |
| Jadestone | Dispersant, Transfer Pump | Dispersant Transfer Pump Spate 75c | 1 | Darwin |
| Jadestone | Dispersant | Dasic Slickgone NS Dispersant (1000lt IBC) | 5 | Darwin |
| | | | | |
| SANTOS WA 10/05/2021 | | | | |
| Santos WA | Absorbent, Boom | Boom, 3metre x 180mm | 120 metres | WA, Exmouth |
| Santos WA | Absorbent, Boom | Boom, 3metre x 180mm | 144 metres | WA, Varanus Island |
| Santos WA | Absorbent, Roll | Roll,40mx1.1m | 280 metres | WA, Varanus Island |
| Santos WA | Boom, Nearshore | Zoom Boom | 400 metre | WA, Varanus Island |
| Santos WA | Boom, Nearshore | Harbo T-Fence Boom | 200 metre | WA, Varanus Island |
| Santos WA | Boom, Offshore | Expandi self-inflating boom – 2 x 200 m vertical bundles | 400 metre | WA, Dampier |
| Santos WA | Boom, Offshore | Power pack for Expandi Self-inflating Boom | 1 unit | WA, Dampier |
| Santos WA | Boom, Offshore | Roto Cassette Retrieval Reel for Expandi Self-inflating Boom | 1 unit | WA, Dampier |
| Santos WA | Boom, Offshore | Power Pack for Expandi Sea Curtain Boom | Out of Service | WA, Exmouth |
| Santos WA | Boom, Offshore | Sea Curtain Boom (Kepner – self inflation) – 2 x reels | Out of Service | WA, Exmouth |
| Santos WA | Boom, Offshore | Expandi self-inflating boom – 4 x 200 m vertical bundles | 800 metre | WA, Varanus Island |
| Santos WA | Boom, Offshore | Power pack for Expandi self-inflating boom | 1 Unit | WA, Varanus Island |
| Santos WA | Boom, Offshore | Roto Cassette Retrieval Reel for Expandi Self-inflating Boom | 1 Unit | WA, Varanus Island |
| Santos WA | Boom, OnShore | Beach Guardian Boom | 200 metre | WA, Varanus Island |
| Santos WA | Boom, OnShore | Beach Guardian, Deployment Kit | 2 unit | WA, Varanus Island |
| Santos WA | Dispersant, Spray Systems | Double AFEDO Head Spray System | 1 unit | WA, Dampier |
| Santos WA | Dispersant, Spray Systems | Double Arm Spray System | 1 unit | WA, Dampier |
| Santos WA | Dispersant, Spray Systems | Single Arm Spray System | 1 unit | WA, Exmouth |
| Santos WA | Dispersant, Spray Systems | 4 x Lance Head Spray System | 1 unit | WA, Exmouth |
| Santos WA | Dispersant, Spray Systems | Double Arm Spray System | 1 unit | WA, Exmouth |

| | | | | |
|---|---|---|---|---|
| Santos WA | Shoreline Clean-up Container | 40ft Container (W/barrows,Shovels,Brooms,Squeegy, sorbents) | 1 unit | WA, Varanus Island |
| Santos WA | Skimmer, Oleophilic/Brush | Skimmer, Disc and brush, Desmi DBD 16, incl. hoses and power | 1 unit | WA, Dampier |
| Santos WA | Skimmer, Oleophilic/Brush | Skimmer, Disc and brush, Desmi DBD 16, incl. hoses and power | 1 unit | WA, Varanus Island |
| Santos WA | Temporary Storage | CORT Bladder Tank | 3 unit | WA, Varanus Island |
| Santos WA | Tracking Buoys | Fastwave | 6 unit | WA, Dampier |
| Santos WA | Tracking Buoys | i-Sphere | 2 unit | WA, Exmouth |
| Santos WA | Tracking Buoys | Fastwave | 2 unit | WA, Ningaloo Vision |
| Santos WA | Tracking Buoys | Fastwave | 4 unit | WA, Varanus Island |
| Santos WA | Vessel | 28'Aluminium Response Vessel "Monte Belle" | 1 unit | WA, Varanus Island |
| | | | | |
| SANTOS East as at - 24/11/2020 | | | | |
| Santos East | Vessel | 8 mtr Shark Cat "TREGALANA" with spray equipment | 1 unit | Port Bonython<br>Shark-Cat is current out of survey and requires minor repairs – vessel is currently out of service accordingly. PB team working on rectification to reinstate to “available” condition – timing TBC. |
| Santos East | Vessel | 6 Mtr Stabi Craft with 135 HP Outboard | 1 unit | Port Bonython<br>Vessel is in water and ready to be deployed when required. |
| Santos East | Vessel | 3.66 Mtr Clark Open Boat  Aluminium Dinghy with 9hp Outboard | 1 unit | Port Bonython<br>Available – however not registered and only used for ballast pond operations, not for sea use. |
| Santos East | Vessel | 4.08 Mtr Alocraft Sprint, Aluminium Open Boat  20hp Outboard | 1 unit | Port Bonython |
| Santos East | Dispersant, Spray Systems | Afedo  Dispersant Spray System 100TS | 1 unit | Port Bonython |
| Santos East | Boom, Nearshore | Vikoma Shoreline ( blowers x3 and water pumps x2 for deployment ) | 1000m | Port Bonython<br>Available and ready for use – 3 x blowers and 2 x water pumps |
| Santos East | Dispersant | Slickgone NS | 4 m3 | Port Bonython<br>And<br>Corexit 9527 X 5m3 |
| | | | | |
| VIVA as at 10/05/2021 | | | | |
| Viva | Boom, OnShore | Beach Guardian, 25 metre | 150m | Victoria, Geelong |
| Viva | Boom, Nearshore | Zoom Boom, 25 metre | 200m | Victoria, Geelong |
| Viva | Boom, Nearshore | Fence Boom, 500mm, 20 metre | Nil | Victoria, Geelong |
| Viva | Boom, Nearshore | Fence Boom, 600mm, 20 metre | 160m | Victoria, Geelong |
| Viva | Temporary Storage | 10,000 Fastank | 2 units | Victoria, Geelong |
| Viva | Skimmer, Oleophilic | Disc, 12k Komara | 1 unit | Victoria, Geelong |
| Viva | Skimmer, Vacumm | Manta Ray Head | 1 unit | Victoria, Geelong |
| Viva | Boom, OnShore | Beach Guardian, Deployment Kit | 1 unit | Victoria, Geelong |
| | | | | |
| WOODSIDE as 10/05/2021 | | | | |
| Woodside | Boom, Onshore | Fence Boom | 150m | WA, Dampier |

| | | | | |
|---|---|---|---|---|
| Woodside | Boom, Onshore | Lamor Shore Seal | 200m | WA, Dampier |
| Woodside | Boom, Onshore | Shore Guardian, 20 metre | 160m | WA, Dampier |
| Woodside | Boom, (Curtin on reel) | Curtain Boom, 30 metre lengths | 300m | WA, Dampier |
| Woodside | Boom, Nearshore | Zoom Boom, 25 metre | 175m | WA, Dampier |
| Woodside | Boom, Nearshore | Zoom Boom, 50 metre | 200m | WA, Dampier |
| Woodside | Boom, Nearshore | Lamor inflatable Boom | 250m | WA, Dampier |
| Woodside | Boom, Offshore | Offshore Boom on reel 200m per reel | 400m | WA, Dampier |
| Woodside | Skimmer, Vacuum | Delta Ray Head | 2 units | WA, Dampier |
| Woodside | Skimmer, Weir | Dragon Fly Weir Skimmer | 1 unit | WA, Dampier |
| Woodside | Skimmer, Weir | Global 30m3/hr Weir Skimmer | 1 unit | WA, Dampier |
| Woodside | Skimmer | Lamor 12 - Multi Skimmer | 1 unit | WA, Dampier |
| Woodside | Boom, Nearshore | Anchoring Systems | 21 units | WA, Dampier |
| Woodside | Shoreline Clean-up | Spades, Rakes, Some PPE etc. | multiple units | WA, Dampier |
| Woodside | Shoreline Clean-up | Decontamination Kit | 2 unit | WA, Dampier |
| Woodside | Temporary Storage | Lamor storage tanks (like fast tanks) 7000L | 2 units | WA, Dampier |
| Woodside | Dispersant | Slickgone NS | 1 m3 on each vessel (2x OSV's) | WA, Dampier/ Exmouth, Supply Vessels |
| Woodside | Dispersant | Slickgone NS | 5 m3 | WA, Dampier |
| Woodside | Dispersant, Spray Systems | Alfedo Set | 1 unit | WA, Exmouth |
| Woodside | Dispersant, Spray Systems | Alfedo Set | 1 unit | WA, Dampier |
| Woodside | Gas monitors | Auto Rea | x6 | KBSF |

# Product Totals by Location Report

Friday, 4 June 2021
8:30:46 AM

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| **Broome** | | | | | | |
| 2 | 2 | | G-033 | Afedo Spray System 200-TS | Dispersant Spray Equipment | Supply Base 3 |
| 1 | 1 | | G-041 | Lamor Hydraulic Power Pack | Power Packs, Pumps & Accessories | Supply Base 3 |
| 1 | 1 | | G-052 | Minimax Brush Skimmer | Skimmer | Supply Base 3 |
| 2 | 2 | 400 | G-092 | 200m HDB 1300 Boom on Hyd Reel | Boom | Supply Base 3 |
| 4 | 4 | 100 | G-110 | Beach Guardian Boom | Boom | Supply Base 3 |
| 8 | 8 | 200 | G-111 | Zoom Boom | Boom | Supply Base 3 |
| 1 | 1 | | G-130 | Beach Guardian Deployment Kit | Boom Accessories | Supply Base 3 |
| 4 | 4 | | G-133 | Zoom Boom Anchor Kit | Boom Accessories | Supply Base 3 |
| 1 | 1 | | G-141 | Vikotank 13000 litres | Waste Storage | Supply Base 3 |
| 16 | 16 | | G-150 | Sorbent Boom | Sorbents | Supply Base 3 |
| 3 | 3 | | G-151 | Sorbent Squares | Sorbents | Supply Base 3 |
| 3 | 3 | | G-184 | Shipping Container | General | Supply Base 3 |
| 1 | 1 | | G-330 | Oiled fauna kit | Decontamination | Supply Base 3 |
| 1 | 1 | | G-331 | Decontamination Kit | Decontamination | Supply Base 3 |
| 1 | 1 | | G-400 | Boom Cage | Misc | Supply Base 3 |
| 1 | 1 | | G-401 | Boom Cage | Misc | Supply Base 3 |
| 1 | 1 | | G-500 | Response tool box | General | Supply Base 3 |
| 14 | 14 | | G-607 | Ardrox 6120 | Dispersant | DG Shed |
| **Exmouth** | | | | | | |
| 1 | 1 | | G-030 | Vikospray Spray Unit | Dispersant Spray Equipment | Harold Holt |
| 1 | 1 | | G-031 | Simplex Helicopter Bucket | Dispersant Spray Equipment | Harold Holt |
| 1 | 1 | | G-032 | Dispersant Transfer Pump | Dispersant Spray Equipment | Harold Holt |
| 1 | 1 | | G-033 | AFEDO Ecospray 80W | Dispersant Spray Equipment | Harold Holt |
| 1 | 1 | | G-040 | Ro-Boom Power Pack | Power Packs, Pumps & Accessories | Harold Holt |
| 1 | 1 | | G-051 | Komara 12K Skimmer | Skimmer | Harold Holt |
| 1 | 1 | | G-052 | Minimax Brush Skimmer | Skimmer | Harold Holt |
| 1 | 1 | | G-054 | Passive Weir Skimmer Kit | Skimmer | Harold Holt |
| 1 | 1 | | G-070 | Ro-Vac | Skimmer | Harold Holt |
| 1 | 1 | | G-079 | GT 185 Weir Skimmer | Skimmer | Harold Holt |

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 2 | 2 | | G-090 | Hydraulic Powered reel Winder | Boom Accessories | Harold Holt |
| 2 | 2 | 400 | G-091 | Ro-Boom | Boom | Harold Holt |
| 20 | 20 | 500 | G-110 | Beach Guardian Boom | Boom | Harold Holt |
| 20 | 20 | 500 | G-111 | Zoom Boom | Boom | Harold Holt |
| 3 | 3 | | G-130 | Beach Guardian Deployment Kit | Boom Accessories | Harold Holt |
| 1 | 1 | | G-132 | Shoreline Boom Anchoring kit | Boom Accessories | Harold Holt |
| 10 | 10 | | G-133 | Zoom Boom Anchor Kit | Boom Accessories | Harold Holt |
| 2 | 2 | | G-140 | Fastank Temporary Storage | Waste Storage | Harold Holt |
| 1 | 1 | | G-160 | Rope Mop 240 Oil Skimming Machine | Skimmer | Harold Holt |
| 1 | 1 | | G-181 | General Support Trailer | Trailer | Harold Holt |
| 2 | 2 | | G-184 | Shipping Container | General | Harold Holt |
| 10 | 10 | | G-186 | Wheelbarrow | General | Harold Holt |
| 1 | 1 | | G-260 | 15kva Generator | Trailer | Harold Holt |
| 1 | 1 | | G-330 | Oiled fauna kit | Decontamination | Harold Holt |
| 1 | 1 | | G-335 | Decontamination Kit (PPE) | Decontamination | Harold Holt |
| 1 | 1 | | G-336 | Decontamination Kit Locker | Decontamination | Harold Holt |
| 1 | 1 | | G-337 | Shoreline Accessories Cage | General | Harold Holt |
| 3 | 3 | | G-400 | Boom Cage | Misc | Harold Holt |
| 5 | 5 | | G-401 | Boom Cage | Misc | Harold Holt |
| 30 | 30 | | G-604 | Slickgone NS | Dispersant | Harold Holt |
| 45 | 45 | | G-605 | Slickgone NS | Dispersant | Harold Holt |
| 1 | 1 | | G-610 | Dispersant Agitator | General | Harold Holt |

## Fremantle

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 1 | 1 | | G-029 | Boom Vane Dispersant Spray System | Dispersant Spray Equipment | Outside Warehouse |
| 1 | 1 | | G-030 | Vikospray Spray Unit | Dispersant Spray Equipment | |
| 5 | 5 | | G-033 | AFEDO Spray System | Dispersant Spray Equipment | Outside Warehouse |
| 1 | 1 | | G-034 | Global Dispersant Spray System | Dispersant Spray Equipment | Outside Warehouse |
| 1 | 1 | | G-035 | GTA 30 Oil Transfer Pump | Power Packs, Pumps & Accessories | 2D |
| 4 | 4 | | G-037 | GX-160 Honda Water Pump | Power Packs, Pumps & Accessories | Outside Warehouse |
| 9 | 9 | | G-039 | 2 Stroke Air Blower | General | Outside Warehouse |
| 1 | 1 | | G-040 | Ro-Boom Power Pack | Power Packs, Pumps & Accessories | 4B |
| 3 | 3 | | G-042 | Hydraulic Power Pack LPP 36 | Power Packs, Pumps & Accessories | 12, 13, 14 |
| 1 | 1 | | G-043 | Hydraulic Power Pack LPP7 | Power Packs, Pumps & Accessories | |

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 1 | 1 | | G-044 | Spare Control Stand for LPP36 | Power Packs, Pumps & Accessories | 2A |
| 3 | 3 | | G-045 | Hydraulic Air Blower | General | 12, 13, 14 |
| 1 | 1 | | G-051 | Komara 12K Skimmer | Skimmer | 3B, 3E |
| 2 | 2 | | G-052 | Minimax Brush Skimmer | Skimmer | 2C, 2F, 2B, 2E |
| 1 | 1 | | G-053 | Komara 20K Skimmer | Skimmer | 3C, 3F |
| 1 | 1 | | G-054 | Passive Weir Skimmer Kit | Skimmer | 4C, 4F |
| 2 | 2 | | G-060 | Lamor Rock Cleaner | General | 1C, 1F, 1B, 1E |
| 3 | 3 | | G-081 | LWS500 Weir Skimmer | Skimmer | 12, 13, 14 |
| 6 | 6 | | G-090 | Hydraulic Powered reel Winder | Boom Accessories | 14, 13, 12 |
| 6 | 6 | 1200 | G-091 | Ro-Boom | Boom | 14, 13, 12 |
| 23 | 23 | 575 | G-110 | Beach Guardian Boom | Boom | Outside Warehouse |
| 30 | 30 | 750 | G-111 | Zoom Boom | Boom | 4 A/D, Outside Warehouse |
| 18 | 18 | 540 | G-112 | 450mm Curtain Boom | Boom | Outside Warehouse |
| 1 | 1 | | G-113 | Current Buster 2 | Boom | |
| 2 | 2 | | G-130 | Beach Guardian Deployment Kit | Boom Accessories | 4E |
| 3 | 3 | | G-131 | Ro-Boom Anchoring System | Boom Accessories | 12, 13, 14 |
| 28 | 28 | | G-133 | Zoom Boom Anchor Kit | Boom Accessories | Outside Warehouse |
| 2 | 2 | | G-140 | Fastank Temporary Storage | Waste Storage | Outside Warehouse |
| 2 | 2 | | G-142 | 25000lt Lancer Storage Barge | Waste Storage | Outside Warehouse |
| 3 | 3 | | G-143 | 25 Cube Deck Storage Tanks | Waste Storage | Outside Warehouse |
| 4 | 4 | | G-144 | LCT 11.4 Collapsable Storage Tank | Waste Storage | Outside Warehouse |
| 1 | 1 | | G-161 | Rope Mop 260 Oil Skimming Machine | Skimmer | Warehouse 2 |
| 1 | 1 | | G-172 | Heli 7 Tonne Forklift | Vehicle | Warehouse |
| 1 | 1 | | G-180 | Mobile Workshop Trailer | Trailer | Warehouse 3 |
| 2 | 2 | | G-181 | Galvanised Tandem Trailer | Trailer | Outside Warehouse |
| 5 | 5 | | G-183 | Aluminium Container | General | Outside Warehouse |
| 9 | 9 | | G-184 | Shipping Container | General | Outside Warehouse |
| 5 | 5 | | G-188 | I SPHERE Satellite Drift Buoys | Communications | 1A |
| 2 | 2 | | G-189 | Spot Gen 3 | Communications | Head Office |
| 6 | 6 | | G-195 | Communications Radio | Communications | Warehouse Office |
| 1 | 1 | | G-199 | Bird Scarer | Wildlife Support | 1D |
| 1 | 1 | | G-200 | Zodiac Pro 500 | Vessel | Warehouse |
| 2 | 2 | | G-259 | Portable Generator | General | Warehouse, Wildlife Container |

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 1 | 1 | | G-262 | Vehicle Washdown Trailer | Trailer | Warehouse 2 |
| 1 | 1 | | G-325 | Fauna Hazing & Exclusion Kit | Wildlife Support | |
| 3 | 3 | | G-326 | Fauna hazing & capture kits | Wildlife Support | Warehouse |
| 1 | 1 | | G-332 | Wildlife washdown container | Wildlife Support | Outside Warehouse |
| 1 | 1 | | G-333 | Shoreline Support Kit | General | 3A |
| 1 | 1 | | G-334 | Shoreline Flushing Kit | Power Packs, Pumps & Accessories | 3D |
| 1 | 1 | | G-336 | Decontamination Kit Locker | Decontamination | 7 C/F |
| 1 | 1 | | G-400 | Boom Cage | Misc | 4 A/D |
| 8 | 8 | | G-605 | Slickgone NS | Dispersant | Outside Warehouse, Dispersant Area |
| 27 | 27 | | G-606 | Corexit 9500 | Dispersant | Outside Warehouse, Dispersant Area |
| 1 | 1 | | G-610 | Dispersant Agitator | General | Warehouse |
| 1 | 1 | | G-700 | Phantom 4 Drone | General | Head Office |
| 1 | 1 | | G-750 | Aerial Surveillance Kit | General | Head Office |
| 1 | 1 | | G-770 | Shoreline Surveillance Kit | Misc | |
| 2 | 2 | | G-808 | Gas Alert Monitor (Microclip) | General | Head Office |
| 1 | 1 | | G-809 | Air Quality Monitoring System | Misc | Head Office |
| 4 | 4 | | G-850 | Ancilliaries box 1 | General | Outside Warehouse |
| 4 | 4 | | G-851 | Ancilliaries Box 2 | General | Outside Warehouse |
| 2 | 2 | | G-889 | Oil sampling kit | General | Outside Warehouse |
| 1 | 1 | | G-950 | AMOSC Vehicle | Vehicle | Warehouse |
| 1 | 1 | | G-960 | CF Moto u550 | Vehicle | Warehouse |

## Nth Geelong

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 1 | 1 | | G-029 | Boom Vane Dispersant Spray System | Dispersant Spray Equipment | Outside Warehouse |
| 2 | 2 | | G-030 | Vikospray Spray Unit | Dispersant Spray Equipment | Bay D |
| 1 | 1 | | G-031 | Simplex Helicopter Bucket | Dispersant Spray Equipment | Bay D |
| 1 | 1 | | G-032 | Dispersant Transfer Pump | Dispersant Spray Equipment | Bay D |
| 3 | 3 | | G-033 | Afedo Spray System 200 DFWE | Dispersant Spray Equipment | Outside Warehouse |
| 1 | 1 | | G-035 | GTA 30 Oil Transfer Pump | Power Packs, Pumps & Accessories | Bay P |
| 2 | 2 | | G-039 | 2 Stroke Air Blower | General | Warehouse |
| 1 | 1 | | G-040 | Ro-Boom Power Pack | Power Packs, Pumps & Accessories | Bay A |
| 3 | 3 | | G-042 | Hydraulic Power Pack LPP 36 | Power Packs, Pumps & Accessories | Bay A |
| 1 | 1 | | G-044 | Spare Control Stand for LPP36 | Power Packs, Pumps & Accessories | Bay K |
| 3 | 3 | | G-045 | Hydraulic Air Blower | General | Bay A |

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 2 | 2 | | G-050 | Komara 30K Skimmer | Skimmer | Bay J |
| 2 | 2 | | G-051 | Komara 12K Skimmer | Skimmer | Bay J |
| 1 | 1 | | G-052 | Minimax Brush Skimmer | Skimmer | Bay K |
| 1 | 1 | | G-054 | Passive Weir Skimmer Kit | Skimmer | Bay K |
| 2 | 2 | | G-060 | Lamor Rock Cleaner | General | Bay O |
| 3 | 3 | | G-070 | Ro-Vac | Skimmer | Bay P |
| 1 | 1 | | G-079 | GT 185 Weir Skimmer | Skimmer | Bay C |
| 1 | 1 | | G-080 | Desmi 250 Weir Skimmer | Skimmer | Outside Warehouse |
| 3 | 3 | | G-081 | LWS500 Weir Skimmer | Skimmer | Bay A |
| 2 | 2 | | G-082 | Ro-Skim Weir Boom System | Skimmer | Outside Warehouse |
| 1 | 1 | | G-083 | Canadyne Multi Head Skimmer | Skimmer | Bay K |
| 1 | 1 | | G-084 | Versatech Multi Head Skimmer | Skimmer | Bay C |
| 8 | 8 | | G-090 | Hydraulic Powered reel Winder | Boom Accessories | Bay A |
| 7 | 7 | 1400 | G-091 | Ro-Boom | Boom | Bay A |
| 1 | 1 | 36 | G-093 | 36m Ro-Boom | Boom | Bay A |
| 51 | 51 | 1275 | G-110 | Beach Guardian Boom | Boom | Bay L, Training Trailer |
| 135 | 135 | 3375 | G-111 | Zoom Boom | Boom | Bay L, Training Trailer, Outside Warehouse |
| 40 | 40 | 1200 | G-112 | 450mm Curtain Boom | Boom | Outside Warehouse, Bay L, Training Trailer |
| 1 | 1 | | G-114 | Speed Sweep | Boom | Bay E |
| 3 | 3 | | G-120 | General Purpose Pump | Power Packs, Pumps & Accessories | Bay P |
| 1 | 1 | | G-121 | DOP 250 Pump | Power Packs, Pumps & Accessories | Bay P |
| 8 | 8 | | G-130 | Beach Guardian Deployment Kit | Boom Accessories | Training Trailer, Bay M |
| 3 | 3 | | G-131 | Ro-Boom Anchoring System | Boom Accessories | Bay A |
| 4 | 4 | | G-132 | Shoreline Boom Anchoring kit | Boom Accessories | Bay M |
| 22 | 22 | | G-133 | Zoom Boom Anchor Kit | Boom Accessories | Training Trailer, Bay K |
| 2 | 2 | | G-135 | Dual Hull magnet - 1000Kg | Boom Accessories | Charging Station Area |
| 4 | 4 | | G-140 | Fastank Temporary Storage | Waste Storage | Training Trailer, Bay M |
| 1 | 1 | | G-141 | Vikotank 13000 litres | Waste Storage | Bay M |
| 2 | 2 | | G-142 | 25000lt Lancer Storage Barge | Waste Storage | Bay F |
| 3 | 3 | | G-143 | Deck Bladder | Waste Storage | Bay G |
| 65 | 65 | | G-150 | Sorbent Boom | Sorbents | Bay N |
| 40 | 40 | | G-151 | Sorbent Squares | Sorbents | Bay N |
| 96 | 96 | | G-152 | Viscous Oil Snares | Sorbents | Bay N |

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 11 | 11 | | G-153 | Sorbent Roll | Sorbents | Bay N |
| 31 | 31 | | G-154 | Spare Rope Mops | Sorbents | Trailer Bay |
| 1 | 1 | | G-160 | Rope Mop 240 Oil Skimming Machine | Skimmer | Trailer Bay |
| 1 | 1 | | G-161 | Rope Mop 260 Oil Skimming Machine | Skimmer | Trailer Bay |
| 1 | 1 | | G-162 | Egmopol Barge | Skimmer | Warehouse |
| 2 | 2 | | G-172 | Hyster 2 Tonne forklift | Vehicle | Warehouse |
| 1 | 1 | | G-180 | Decon Support Trailer | Trailer | Trailer Bay |
| 3 | 3 | | G-181 | General Support Trailer | Trailer | Trailer Bay |
| 1 | 1 | | G-182 | Egmopol Trailer | Trailer | Warehouse |
| 1 | 1 | | G-183 | Aluminium Container | General | |
| 11 | 11 | | G-184 | Shipping Container | General | Outside Warehouse, Dispersant Area |
| 13 | 13 | | G-185 | IBC | Waste Storage | North Wall |
| 1 | 1 | | G-188 | I SPHERE Satellite Drift Buoys | Communications | Charging Station Area |
| 5 | 5 | | G-189 | Spot Gen 3 | Communications | Head Office |
| 1 | 1 | | G-190 | VHF/UHF Base station | Communications | R17T |
| 18 | 18 | | G-195 | Communications Radio | Communications | Bay 9, Warehouse Office |
| 1 | 1 | | G-201 | 9m Aluminium Catamaran | Vessel | Warehouse |
| 3 | 3 | | G-259 | Portable Generator | General | Bay, Wildlife Container |
| 1 | 1 | | G-260 | Trailer/Generator/Karcher Pressure Washer Unit | Trailer | Trailer Bay |
| 1 | 1 | | G-261 | 4in shore line flushing kit | General | Bay O |
| 1 | 1 | | G-262 | Vehicle Washdown Trailer | Trailer | Trailer Bay |
| 2 | 2 | | G-263 | Diesel Pressure Washer | Power Packs, Pumps & Accessories | Bay O |
| 1 | 1 | | G-325 | Fauna Hazing & Exclusion Kit | Wildlife Support | |
| 2 | 2 | | G-330 | Oiled fauna kit | Decontamination | Bay H |
| 1 | 1 | | G-332 | Wildlife washdown container | Wildlife Support | Outside Warehouse |
| 1 | 1 | | G-334 | 3 in Shoreline Flushing Kit | Power Packs, Pumps & Accessories | Bay O |
| 1 | 1 | | G-335 | Decontamination PPE Kit (First Strike Support) | Decontamination | Bay I |
| 1 | 1 | | G-336 | Decontamination Kit Locker | Decontamination | Bay I |
| 1 | 1 | | G-338 | Shoreline Impact Lance Kit | Power Packs, Pumps & Accessories | Bay O |
| 24 | 24 | | G-400 | Boom Cage | Misc | Bay 12, Bay L |
| 13 | 13 | | G-401 | Boom Cage | Misc | Bay L, Bay K |
| 1 | 1 | | G-500 | Response tool box | General | Warehouse Store |
| 8 | 8 | | G-604 | Slickgone NS | Dispersant | Bay 0 |

| Quantity | Available | Length | Product# | Product Name | Product Category | Bay Location |
|---|---|---|---|---|---|---|
| 67 | 67 | | G-605 | Slickgone NS | Dispersant | Bay 0 |
| 62 | 62 | | G-606 | Corexit 9500 | Dispersant | Bay 0, Outside Warehouse |
| 1 | 1 | | G-610 | Dispersant Agitator | General | Dispersant |
| 2 | 2 | | G-700 | DJI Spark | General | Head Office |
| 1 | 1 | | G-750 | Aerial Surveillance Kit | General | Head Office |
| 1 | 1 | | G-760 | Dispersant Effectiveness Field Test Kit | Dispersant | Head Office |
| 6 | 6 | | G-808 | Gas Alert Monitor (Microclip) | General | Head Office |
| 1 | 1 | | G-889 | Oil sampling kit | General | Outside warehouse |
| 3 | 3 | | G-950 | AMOSC Vehicle | Vehicle | Warehouse, Head Office |
| 1 | 1 | | G-960 | CF Moto u550 | Vehicle | Warehouse |

# Appendix B – Dispersant Application Risk Assessment

Table B.1 provides a summary of potential impacts associated with the application of chemical dispersants.

**Table B.1 : Potential impacts associated with dispersant application**

| Aspect | Source of Risk | Potential Impact | Severity Factor | Likelihood Factor | Residual Risk | Decision Context | Acceptability | Mitigative Control Measures |
|---|---|---|---|---|---|---|---|---|
| Chemical Dispersant Application | Chemical components of dispersant in isolation and / or combined with hydrocarbon. | Reduction in water quality.<br>Toxic effects of chemical dispersants on sensitive marine fauna (including larvae) / flora. | 30 | Probable (0.3) | 9 | Type A<br>Low Order Risk | Tolerable | RS-CM-18<br>RS-CM-19<br>RS-CM-20<br>RS-CM-21<br>RS-CM-22<br>RS-CM-23 |
| | | Toxic effects of chemical dispersant in combination with hydrocarbon on sensitive marine fauna (including larvae) / flora | 30 | Probable (0.3) | 9 | Type A<br>Low Order Risk | Tolerable | |
| | Increase in entrained hydrocarbon within water column. | Reduction in water quality.<br>Toxic effects from entrained hydrocarbon on marine fauna / flora. | 30 | Probable (0.3) | 9 | Type A<br>Low Order Risk | Tolerable | |
| | | Smothering benthic communities (submerged reefs and shoals, and seagrasses) with entrained hydrocarbon. | 10 | Unlikely (0.1) | 1 | Type A<br>Low Order Risk | Tolerable | RS-CM-17 |
| | Presence of chemical dispersant on surface and within water column. | Alteration in behaviour of EPBC listed, threatened or migratory species. | 10 | Unlikely (0.1) | 1 | Type A<br>Low Order Risk | Tolerable | |

Spill modelling indicates a potential net benefit from the surface application of chemical dispersant on crude given the resulting potential reduction in shoreline loading across all shoreline (refer Section 6.3.2), whilst SSDI has been shown to have limited benefit (refer Section 6.3.3).

Dispersants have an inherent level of toxicity. Additionally, chemically dispersed hydrocarbons may, in certain instances, have a higher level of toxicity to benthic communities than the hydrocarbons themselves. Dispersant use results in increased hydrocarbon entrainment in the water column, increasing the bioavailability of the hydrocarbon potentially impacting subtidal values and sensitivities, particularly in shallow water environments. Monitoring undertaken after the Montara spill resulted in entrained hydrocarbons concentrating in the top 25 m of the water column (AMSA, 2010).

Information presented in this section relates to Pyrenees crude. The crude oil produced from the Pyrenees reservoirs has very similar properties; as such the effects of chemical dispersant applicant to Stickle and Crosby crude can be assumed to be similar to the information presented below for Pyrenees crude. Pyrenees crude is the generic term for crude oil produced from the Pyrenees reservoirs (Crosby, Ravensworth, Stickle, Tanglehead Wild Bull [upper Pyrenees] and Moondyne).

*Toxicity Effects of Chemical Dispersants*

Oil dispersants do not reduce the total amount of oil entering the marine environment; however, they can disperse surface oil before it reaches the shoreline. The chemical agents used as a dispersant work by reducing the tension between oil and water, thereby enhancing the natural process of dispersion and biodegradation that takes place when waves mix large numbers of small droplets into the water beneath a slick. The decision to use dispersants is a trade-off between decreasing the risk to organisms that utilise the water's surface and coastline, and possibly increasing the risk to fish populations, seagrasses and coral reefs, and organisms that live on the seafloor and within the water column if these groups are exposed to dispersed oil before the natural processes of biodegradation have removed the oil from the system.

The acute toxicity of chemically dispersed oil is primarily associated with the dissolved oil following dispersal, not with the actual dispersants (NRC, 2005). Data from numerous studies collated as part of the NRC review of dispersant efficacy and effects included the results of studies examining the toxicity of Corexit 9500 and Corexit 9527A (the two most common and readily available dispersants) to seven species (4 fish, 2 mysid shrimp and 1 oyster). The results indicate that for all species tested, the Corexit dispersants were less toxic than the chemically enhanced water-accommodated fraction (i.e., dispersant and dispersed hydrocarbon), which were less toxic than the untreated water-accommodated fraction of oil.

It is generally thought that the dispersants available at present are expected to be much less toxic than early generation dispersants. The toxicity of dispersants used in the early 1970s ranged from 5 to 50 mg/L measured as an LC50 to rainbow trout over 96 hours while dispersants available today, vary from 200 to 500 mg/L in toxicity and contain a mixture of surfactants and a less toxic solvent (Fingas, 2002). However, Rial *et.al*. (2013) tested the toxicity of four dispersants on sea urchin embryo larval development and determined that the EC50 varied from 1.2 to 34 mg/L, they concluded that sensitivity to dispersants appears to be species and life stage dependent.

Other studies have reported that dispersants were potentially toxic to corals. Ardrox 6120 was found to be toxic to planula larvae of scleractinian corals *Acropora tenuis*, *Goniastrea aspera* and *Platgyra sinensis* with 100% larval mortality at dispersant concentrations of ≥75 ppm within 12 to 48 hours (Lane and Harrison, 2000). It was noted that the dispersant concentration that caused significant mortality of larvae in this study was well within those that may occur in the field where dispersant has been applied to an oil slick. Where dispersant is applied at the rate of 15% of slick volume (as recommended for many oil types), dispersal of a 1 cm thick slick could result in short-term dispersant concentrations up to 150 ppm to depths of 10 m.

The potential toxicity of dispersants to the early life history stages of corals have also been reported including the potential inhibition of fertilisation and larval settlement in *Acropora tenuis* (Harrison, 1999). Settlement and survival of *Porites astreoides* and *Montastraea faveolata* larvae have been shown to decrease with increasing concentrations (50 ppm and 100 ppm) of Corexit 9500 (Goodbody-Gringley *et al*., 2013) and in *Acropora millepora* exposed to Corexit 9527 (Negri and Heyward, 2000).

A number of dispersants have been identified as being potentially toxic to macroalgae. A review by Lewis and Pryor (2013) reports a range of toxicities to different dispersants from 0.7 ppm of Corexit 9500, 20 ppm of Corexit 9527 and up to 27,000 ppm for other products impacting on germination of brown algae. Studies on adult plants only report sublethal impacts.

Similar studies have reported dispersants having toxic effects on seagrasses. Corexit 9527 and Ardrox 6120 both effected seagrass photosynthesis within the first hour of exposure. In laboratory samples, Shell VDC was reported to result in photosynthetic stress of *Zostera capricorni* after 10 hours of exposure; however, *in situ* samples were less sensitive showing no photosynthetic impact from dispersant and oil and dispersant mixtures (Macinnis-Ng and Ralph, 2003).

*Toxicity Effects of Chemical Dispersants on Pyrenees Crude*

BHP has previously undertaken toxicity testing of Pyrenees crude with and without dispersants (Jacobs, 2015). A full suite of toxicity testing (eight tests with microalgae, macroalgae, sea urchin, bivalve, amphipod and fish larvae) was performed. The data was used to generate species protection percentile curves using the BurrliOZ software to calculate trigger values (TV) for unweathered Pyrenees crude and the chemically dispersed oil (Table B.2). The derived TVs provide an early indication of reaching a level of concern which will assist in directing response and further investigation in the highly unlikely event of a hydrocarbon spill.

The results indicate that the addition of dispersant to unweathered crude increases the level of toxicity (Table B.2). A key effect of dispersant to an oil's toxicity is considered to be due to the dispersant making the more water-soluble oil compounds more bioavailable to organisms. However, Pyrenees crude has inherently low proportions of soluble aromatics (e.g., BTEX) and therefore the toxicity of the dispersants alone may also be a factor in these results.

**Table B.2 : Trigger values based on unweathered Pyrenees crude with and without addition of dispersant**

| Hydrocarbon type | Dispersant application | Level of Species Protection | Trigger Value (ppb) |
|---|---|---|---|
| Pyrenees Crude (unweathered 24 hrs) | None | 99% | 41 |
| | | 95% | 94 |
| | Slickgone NS | 99% | 32 |
| | | 95% | 55 |
| | Ardrox 6120 | 99% | 17 |
| | | 95% | 115 |

### Mitigative Control Measures for Chemical Dispersant Application

Table B.3 details the mitigative control measures applied during chemical dispersant operations. Refer to OPEP for corresponding Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria.

**Table B.3 : Mitigative control measures for dispersant application**

| Control Measure Reference | Mitigative Control Measure |
|---|---|
| RS-CM-17 | Dispersant may only be applied under the following conditions:<br>• when daily SIMA identifies a positive benefit;<br>• within a 50 km radius around the Pyrenees Facility, in water depths greater than 50 m; and<br>• when there are no EPBC Act Listed migratory species evident in the immediate application zone; and<br>• within State jurisdiction following approval from WA DoT; and<br>• within Australian Marine Parks following approval from Director of National Parks (DNP); and<br>• within the Ningaloo Coast World Heritage Area following approval from the DBCA and DNP. |
| RS-CM-18 | Priority given to applying OSCA registered dispersants above those not on OSCA Register. |
| RS-CM-19 | No use of dispersants where transitional acceptance of OSCA register withdrawn (i.e., Slickgone LTSW). |
| RS-CM-20 | Undertake Operational SIMA prior to undertaking chemical dispersant application. |
| RS-CM-21 | Undertake water quality sampling during chemical dispersant application. |
| RS-CM-22 | Undertake dispersant efficacy testing during chemical dispersant application. |
| RS-CM-23 | Monitor dispersant volumes in relation to application location. |

# Appendix C – Operational and Scientific Monitoring Bridging Implementation Plan

# Pyrenees Field: Operational and Scientific Monitoring Bridging Implementation Plan

**Document No: BHPB-04PY-N950-0023**

| REVISION RECORD | | | | | | |
|---|---|---|---|---|---|---|
| **Rev** | **Date** | **Description** | **Prepared by** | **Checked by** | **Reviewed by** | **Approved by** |
| 0 | 13/12/2021 | Issued to NOPSEMA for assessment | Environment Principal Projects | Principal Environment & Regulatory | Regional HSE Lead Australia | Asset Manager |
| | | | | | | |

| Revision History | | |
|---|---|---|
| **Revision Label** | **Revision Date** | **Comments** |
| A | 21/10/2021 | Draft Issued for internal review |
| B | 09/12/2021 | Internal comments incorporated |
| 0 | 13/12/2021 | Issued to NOPSEMA for assessment |
| | | |
| | | |

# Contents

# List of Tables



# List of Figures

# Definitions and Acronyms

| TERMS/ACRONYM | DEFINITION/EXPANSION |
|---|---|
| **ANOVA** | Analysis of Variance |
| **AMOSC** | Australian Marine Oil Spill Centre |
| **API** | American Petroleum Institute |
| **APPEA** | Australian Petroleum Production and Exploration Association |
| **AUV** | Autonomous Underwater Vehicle |
| **BACI** | Before After Control Impact |
| **BTEX** | Benzene, Toluene, Ethylbenzene, and Xylene are hydrocarbons and commonly found in crude oil |
| **BHP** | BHP Petroleum Pty Ltd |
| **BIA** | Biologically Important Area |
| **DFR** | Daily Field Report |
| **EBPC act** | Environmental Biodiversity and Biodiversity Conservation Act 1999 |
| **EP** | Environment Plan |
| **EMBA** | Environment that may be Affected |
| **EMT** | Emergency Management Team |
| **ESC** | Environmental Scientific Coordinator |
| **FPSO** | Floating Production Storage and Offloading |
| | |
| **GIS** | Geographic Information Systems |
| **HSE** | Health, Safety and Environment |
| **IAP** | Incident Action Plan |
| **IFU** | Issued for use |
| **IMT** | Incident Management Team |
| **KSAT** | Kongsberg Satellite Services |
| **NATA** | National Association of Testing Authorities |
| **NEBA** | Net Environmental Benefit Analysis |
| **NOAA** | (United States) National Oceanic and Atmospheric Administration |
| **NOPSEMA** | National Offshore Petroleum Safety and Environmental Management Authority |
| **OM** | Operational Monitoring |
| **OMP** | Operational Monitoring Plan |
| **OPEP** | Oil Pollution Emergency Plan |
| **OSM** | Operational and Scientific Monitoring |
| **OSMBIP** | Operational and Scientific Monitoring Bridging Implementation Plan |
| **OSMP** | Operational and Scientific Monitoring Plan |
| **OSRL** | Oil Spill Response Limited |
| **OSTB** | Oil Spill Tracker Buoys |
| **OSTM** | Oil Spill Trajectory Modelling |
| **OWR** | Oiled Wildlife Response |
| **PPE** | Personal Protective Equipment |
| **QA/QC** | Quality Assurance and Quality Control |
| **ROV** | Remotely Operated Vehicle |
| **SCAT** | Shoreline clean-up assessment technique |
| **SIMA** | Spill Impact Mitigation Assessment |
| **SM** | Scientific Monitoring |
| **SMP** | Scientific Monitoring Plan |
| **SSDI** | Subsea Dispersant Injection |
| **TPH** | Total Petroleum Hydrocarbon |
| **UAV** | Unmanned Aerial Vehicle |
| **US EPA** | United States Environmental Protection Agency |

# 1 Introduction

This document fulfils the requirements for an Operational and Scientific Monitoring Plan (OSMP) under Regulation 14(8AA) and 14(8D) of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (referred to as the Environment Regulations).

## 1.1 Purpose

Oil spills are an inherent risk associated with offshore petroleum activities including but not limited to drilling, exploration, and vessel activities. These events are unlikely to occur, however they pose a threat to the marine environment and the values that it supports (NOPSEMA).

The OSMP is a key part of the offshore petroleum approval process. The OSMP is the principle tool for determining the effect, severity, and persistence of environmental impacts from an oil spill (NOPSEMA, 2016). An OSMP allows Titleholders to determine whether their Environmental Plans are sufficient and meeting their goals. The OSMP can also be used to test how effective the oil spill response is regarding environmental impact and protection (NOPSEMA, 2016). The OSMP can also be used to improve predictive and response capacity for future oil spills.

To create consistency across industry and strengthen responses to oil spills around Australia, the creation of an OSMP Framework through Australian Petroleum Production and Exploration Association (APPEA) was proposed. BHP has elected to use the Joint Industry Operational and Scientific Monitoring (OSM) Framework and supporting Operational Monitoring Plans (OMPs) and Scientific Monitoring Plans (SMPs) as the foundation of its operational and scientific monitoring approach. The Joint Industry OSM Framework is available on the APPEA Environment Publications Webpage. Use of the Joint Industry OSM Framework requires each Titleholder to develop a Bridging Implementation Plan (this Plan) which fully describes how the Framework interfaces with Titleholders own activities, spill risks and internal management systems.

This document is consistent with the APPEA Operational and Scientific Monitoring Bridging Implementation Plan Template (Rev A, March 2021) and acts as a Bridging Implementation Plan (BIP) to the Joint Industry OSMP Framework for petroleum activities undertaken by BHP Petroleum (Australia) Pty Ltd in the Pyrenees Field Development off the North-West coast of Western Australia.

This document (hence forth referred to as the Operational and Scientific Monitoring Bridging Implementation Plan (OSMBIP)) is a component of the environmental management framework, and should be read in conjunction with the activity-specific Environment Plan (EP) and Oil Pollution Emergency Plan (OPEP).

This plan is presented in two parts. Part A outlines the relationship between BHP Petroleum (Australia) Pty Ltd’s Spill Response Document Framework and the Joint Industry Operational and Scientific Monitoring Plan (OSMP) Framework (APPEA, 2021). Part B provides operationally focused guidance for BHP personnel and OSM Service Providers to coordinate the implementation of monitoring plans.

### 1.1.1 Petroleum Activities

This OSMP is relevant to petroleum activities undertaken by BHP Petroleum (Australia) Pty Ltd within Australian Commonwealth waters associated with the Pyrenees Development.

### 1.1.2 Hydrocarbon Properties

Hydrocarbon types associated with Level 2 or Level 3 hydrocarbon spill scenarios within the Pyrenees Field include:

- Crude oil; and
- Marine diesel oil (MDO).

Table 1-1 provides and overview of crude oil properties associated with the Pyrenees Field. A summary of the marine diesel oil properties is provided in Table 1-2.

**Table 1-1: Crosby, Pyrenees, and Stickle Crude Oils and SINTEF's *Martin Linge Crude 13C* Properties**

| Parameter | Crosby Crude Oil [1] | Pyrenees Crude Oil [2] | Stickle Crude Oil [3] | SINTEF: *Martin Linge Crude 13C* |
|---|---|---|---|---|
| API Gravity | 19.42 | 19.3 | 18.7 | 20.73 |
| Wax Content (%) | 0.2 | 0.5 | 0.5 | 0.66 |
| Pour Point (°C) | <-24 | -30 | | -36 |
| Asphaltene (%) | 0.2 | 0.5 | 0.4 | 0.11 |
| Specific Gravity | 0.9376 | 0.9384 | 0.89 | 0.93 |
| Viscosity (cP) | 19 @ 63°C | 59.13 @ 40°C | 11.1 @ 62°C | 294 @ 13°C |

Note 1: Data from Core Laboratories (2003)
Note 2: Data from Intertek (2011)
Note 3: Data from Core Laboratories (2004)

**Table 1-2: Marine Diesel Oil Properties**

| Parameter | Marine Diesel Oil (data from SINTEF's *Marine Diesel IKU*) |
|---|---|
| API Gravity | 0.843 |
| Wax Content (%) | 0.05 |
| Pour Point (°C) | -36 |
| Asphaltene (%) | 0.05 |
| Specific Gravity | 36.4 |
| Viscosity (cP) | 3.9 @ 20°C |

### 1.1.3 Spill Scenarios

This OSMP is applicable to all Level 2 or Level 3 hydrocarbon spills as described within the activity-specific EPs / OPEPs.

## 1.2 BHP Spill Response Document Framework

The inter-relationship of this document to other spill response documentation is presented in Table 1-3 and shown in Figure 1-1.

**Table 1-3: BHP's Spill Response Document Framework**

| Document Title | Document Number | Purpose |
|---|---|---|
| APU Incident Management Plan | AOHSE-ER-0001 | The Incident Management Plan (IMP) describes the process for responding to any credible incident or emergency within the boundaries of Australia in order to ensure the Safety of Personnel, the Environment and BHP Petroleum Assets and Reputation (SPEAR). |
| Activity-Specific Environment Plan | Varies | The EP contains the following:<br>• detailed activity description;<br>• detailed description of the environment that may be affected (EMBA) by a credible worst-case discharge (WCD) scenario;<br>• description and risk assessment of oil spills on environmental values and sensitivities; and<br>• evaluation of controls to prevent oil pollution from the described activity and associated Environmental Performance Outcomes (EPOs) / Environmental Performance Standards (EPSs) and Measurement Criteria |
| Activity-specific Oil Pollution Emergency Plan-Basis of Design and Field Capability Assessment | Varies | The Basis of Design (BOD) and Field Capability Assessment (FCA) presents an overview of the petroleum activity and associated oil spill risks. It includes an evaluation of modelling outcomes from the identified WCD scenarios.<br>It includes a strategic Spill Impact Mitigation Assessment (SIMA) for the identified WCD scenarios associated with the activity.<br>It also provides a detailed evaluation of response need based upon WCD scenarios and presents an oil spill response field capability analysis inclusive of (EPOs), (EPSs) and Measurement Criteria for response preparedness. |
| APU Incident Management Team Capability Assessment | AOHSE-ER-0071 | The Incident Management Team (IMT) Capability Assessment evaluate the size and structure of the BHP IMT (inclusive of Source Control Branch (SCB)) necessary to mobilise and maintain the field capability for a protracted worst-case oil pollution emergency i.e., a LOWC scenario.<br>It provides a detailed evaluation of IMT capability and competency to enable the implementation of response strategies for the full duration of the oil pollution emergency inclusive of (EPOs), (EPSs) and Measurement Criteria for maintenance of IMT capability and competency. |
| Activity-specific Oil Pollution Emergency Plan | Varies | The OPEP is the tool which would be utilised by the BHP IMT during any impending/actual oil spill event to implement the detailed Response Strategies (RS2 – RS13).<br>The OPEP provides a detailed framework for spill response implementation inclusive of (EPOs), (EPSs) and Measurement Criteria for the effectiveness of response strategy implementation. |

| Document Title | Document Number | Purpose |
|---|---|---|
| BHP Australia Source Control Emergency Response Plan | OSRL-SW-PLA-00025 | The Source Control Emergency Response Plan (SCERP) is consistent with the requirements of the BHP Critical Control Performance Standards: Source Control (PET-GDC20-DR-PRD-00063), the Source Control Framework detailed within the International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019) and the APPEA Australian Offshore Titleholder's Source Control Guideline (June 2021). The SCERP includes:<br>• Subsea First Response Toolkit (SFRT) Plan;<br>• Capping Stack Mobilisation Plan; and<br>• Relief Well Plan.<br>Refer directly to SCERP for the implementation of all source control operations. |
| Response Strategies | RS2-RS13 | Response Strategies are detailed guidance documents for the implementation of feasible response strategies identified by the SIMA process. |
| Tactical Response Plans:<br>• Yardie Creek<br>• Turquoise Bay<br>• Mangrove Bay<br>• Jurabi Point to Lighthouse beaches<br>• Muiron Islands | AOHSE-ER-0068<br>AOHSE-ER-0067<br>AOHSE-ER-0065<br>AOHSE-ER-0064<br>AOHSE-ER-0066 | Tactical response plans (TRPs) have been developed for key sensitivities within the Exmouth Region to enact shoreline response strategies in a timely manner. The TRPs provide logistical and deployment guidance at pre-determined coastal access points. |
| Operational and Scientific Monitoring Bridging Implementation Plan - this Plan | BHPB-04PY-N950-0023 | This Plan (the OSMBIP) is consistent with the APPEA Operational and Scientific Monitoring Bridging Implementation Plan Template (Rev A, March 2021) and acts as a Bridging Implementation Plan (BIP) to the Joint Industry OSMP Framework for petroleum activities undertaken by BHP Petroleum (Australia) Pty Ltd in the Pyrenees Field Development off the North-West coast of Western Australia. |

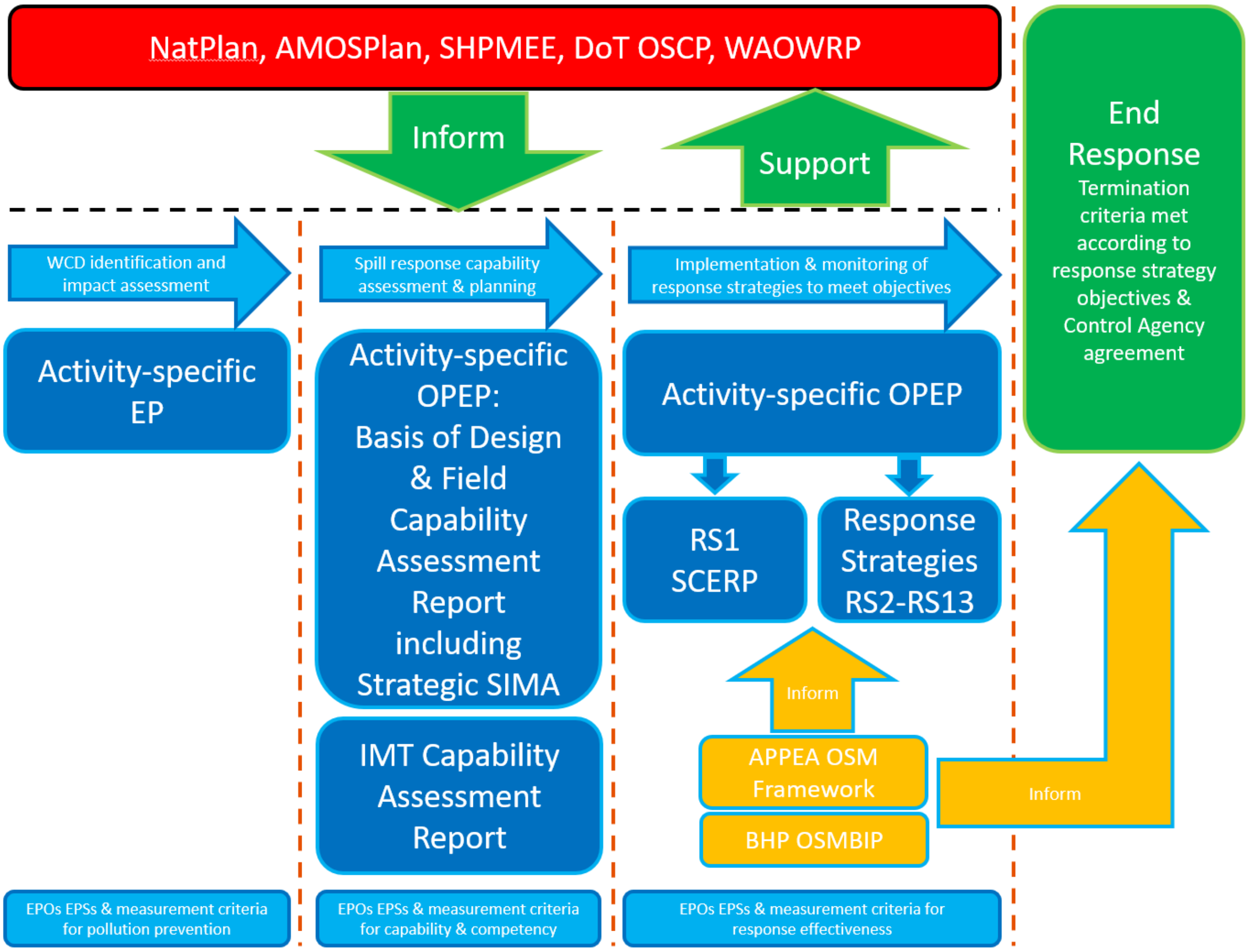



**Figure 1-1: BHP Spill Response Document Framework**

# Part A – Preparedness

# 2 Environment that May Be Affected (EMBA) & Monitoring Priorities

## 2.1 Environment that May Be Affected (EMBA)

The oil exposure values used to define the EMBA within activity-specific EPs was guided by NOPSEMA's Environment Bulletin – Oil Spill Modelling Guideline (NOPSEMA, 2019) as detailed in Table 2-1. The EMBA represents the combined stochastic modelling outputs for an identified worst-case discharge (WCD) oil spill, based on multiple (usually 150) individual spill realisations for each modelled spill scenario. By overlaying all of the realisations onto a single figure, the stochastic modelling shows all the potential areas that could be contacted by hydrocarbons in the event of a spill. The outer geographical extent of the EMBA is determined using the conservative low (contact) exposure values and does not represent the area of actual ecological impact in the event of a spill.

Detailed information on the spill risk and modelling analysis of WCD scenarios is provided in the activity-specific EP and OPEP. Using spill trajectory modelling may be useful to help prioritise environmental resources at risk that may require monitoring or for the collection of baseline data. At the time of writing, the largest EMBA associated with BHP operated assets relates to the Pyrenees Phase 4 Infill Drilling Program (Figure 2-1) and represents the outer geographical extend of OSM planning.

**Table 2-1: Hydrocarbon Exposure Values**

| Hydrocarbon Phase | Exposure Value | | |
|---|---|---|---|
| | Low | Moderate | High |
| Surface (floating) oil | 1 g/m$^2$ | 10 g/m$^2$ | 50 g/m$^2$ |
| Shoreline (accumulated) oil | 10 g/m$^2$ | 100 g/m$^2$ | 1,000 g/m |
| Total submerged oil in the water column (a combination of entrained and dissolved oil components) | 10 ppb | - | 100 ppb |
| Dissolved oil in the water column | 10 ppb | 50 ppb | 400 ppb |

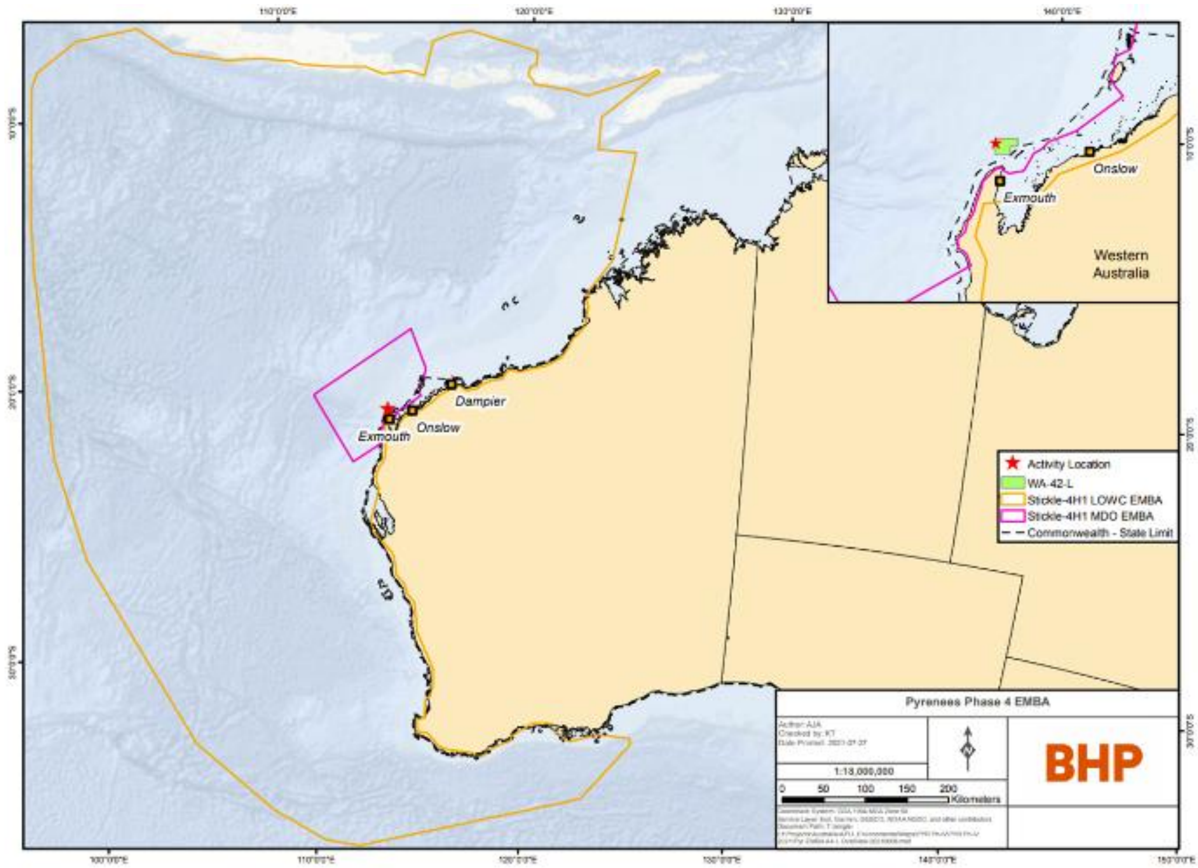



**Figure 2-1: EMBA for Pyrenees Phase 4 Infill Drilling Program**

## 2.2 Monitoring Priorities

Table 2-2 provides a summary of the environmental receptors that would be monitored in the event of a spill incident on the basis of their sensitivity. It also provides the corresponding monitoring procedure that would be provided to the external consultant undertaking the work, noting that the same company may not necessarily be contracted for all monitoring scopes.

Monitoring priorities have been identified through analysis of hydrocarbon spill modelling results against the location of key sensitive receptors with high conservation value; including habitat, species (e.g. State/Commonwealth protected areas, protected species), the sensitivity and/or recoverability of receptors to hydrocarbon impacts, and important socio-economic/heritage values. The Western Australian Department of Transport (WA DoT) has conducted protection prioritisation assessments for coastal environments, which would be used in the determination of protection and monitoring priorities during worst-case spill event.

Detailed information on the spill risks, modelling analysis of scenarios and protection priorities is provided in the activity-specific EP and OPEP. The following tables provide a summary of the locations, key receptors and spill modelling results for the worst-case scenarios from the Pyrenees Phase 4 Infill Drilling Program EP (BHPB-04PY-N950-0021).

Using spill trajectory modelling to help prioritise resources to implement monitoring programs, (including the collection of baseline data) can be useful. For example, sensitive locations with a high probability of rapid contact from an oil spill should be the priority of a monitoring program, compared to similar locations with a lower probability and longer time for contact following a spill, where time may permit the collection of reactive (post-spill but pre-contact) baseline data.

In addition to these locations, there are receptors that are transient (i.e. cetaceans, seabirds) and others that are broadscale, such as managed fisheries with large spatial extents, Key Ecological Features (KEF) and Biologically Important Areas (BIAs). These receptors are described in detail in the activity-specific EP.

The relationship between hydrocarbon exposure levels and degree of impact/risk should be considered when finalising the monitoring design. It should be noted that the monitoring priority locations provided in Table 2-3 to Table 2-5 are listed for planning purposes. BHP will work with its OSM Service Providers and key stakeholders in the initial stages of the spill regarding priority receptors and to assist in the finalisation of the monitoring design. This process is outlined in Section 13.

**Table 2-2: Summary of Environmental Receptors, Description of Monitoring and Applicable BHP Monitoring Procedure**

| Receptor | Sensitivity Ranking | Impact Monitoring | Monitoring Procedure |
|---|---|---|---|
| Water Quality | High | Reactive post-spill pre-impact | BHP *Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna* (AOHSE-ER-0037) |
| Shoreline Sediment Quality (*incorporates Rocky Shorelines*) | High | Reactive post-spill pre-impact | BHP *Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna* (AOHSE-ER-0037) |
| Benthic Infauna (*incorporates Migratory Shorebird Habitat, Sandy Beaches, Intertidal Zone, Mixed Beaches*) | High | Reactive post-spill pre-impact | BHP *Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna* (AOHSE-ER-0037) |
| Avifauna | High | Post-spill | BHP *Incident Action Plan – Seabirds and Migratory Shorebirds* (AOHSE-ER-0038) |
| Marine Mammals (e.g. whales, dolphins, dugongs) and Megafauna (whale sharks) | High | Post-spill | BHP *Incident Action Plan – Marine mammals and Megafauna* (AOHSE-ER-0039) |
| Benthic Habitats and Benthic Primary Producers (Mangroves, Corals, Macroalgae, Sponge Communities and Seagrass) | High | Post-spill | BHP *Incident Action Plan – Benthic Habitats and Benthic Primary Producers* (AOHSE-ER-0040) |
| Marine Reptiles - Turtles | High | Post-spill | BHP *Incident Action Plan – Marine Reptiles* (AOHSE-ER-0043) |
| Commercial and Recreational Fish Species | High | Post-spill | BHP *Incident Action Plan – Commercial and Recreational Fish Species* (AOHSE-ER-0048) |
| Fishes | High | Post-spill | BHP *Incident Action Plan – Effects of an Oil Spill on Fishes* (AOHSE-ER-0051) |
| Aboriginal Cultural Heritage | High | Post-spill | BHP Aboriginal Heritage Procedures (reference BHP MEMO HER A1000) activated by BHP Heritage Team. |

Based upon proximity to the Pyrenees Field, the potential arrival time of hydrocarbons, the probability of contact from a Level 2 / Level 3 spill scenario, the potential extent of exposure to hydrocarbons, and the receptor types at risk, the locations detailed in Table 2-3 would be prioritised for monitoring.

**Table 2-3: Summary of Priority Monitoring Marine Park Locations (Surface Hydrocarbons)**

| Location (Marine Parks) | Receptor Types | Potential Exposure from LOWC (Crude) | | Potential Exposure from Vessel Collision (MDO) | |
|---|---|---|---|---|---|
| | | Probability of Contact % @ ≥1 g/m² | Minimum Time to Contact (days) @ ≥1 g/m² | Probability of Contact % @ ≥1 g/m² | Minimum Time to Contact (days) @ ≥1 g/m² |
| Gascoyne AMP | Water Quality. Avifauna. | 100 | 0.3 | 46.5 | 0.2 |
| Ningaloo AMP | | 94 | 0.5 | 13.5 | 0.2 |
| Muiron Islands MP | | 66.0 | 1.0 | 3.0 | 0.8 |
| Montebello AMP | | 49.3 | 3.7 | 0.8 | 3.3 |
| Barrow Island MP | | 34.0 | 2.6 | 0.8 | 3.3 |
| Carnarvon Canyon AMP | | 16.7 | 11.6 | NC | NC |
| Agro-Rowley Terrace AMP | | 23.3 | 17.5 | NC | NC |
| Thevenard Island MP | | 11.3 | 9.0 | NC | NC |

**Table 2-4: Summary of Priority Monitoring Geographic Feature Locations (Shoreline Accumulated Hydrocarbons)**

| Location (Geographic Features) | Receptor Types | Potential Exposure from LOWC (Crude) | | Potential Exposure from Vessel Collision (MDO) | |
|---|---|---|---|---|---|
| | | Probability of Contact % @ ≥10 g/m² | Minimum time to Contact (Days) @ ≥10 g/m² | Probability of Contact % @ ≥10 g/m² | Minimum Time to Contact (Days) @ ≥10 g/m² |
| Muiron Islands | Shoreline Sediment Quality. Avifauna. Marine Reptiles. Aboriginal Cultural Heritage. | 88.0 | 0.9 | 3.3 | 0.9 |
| Ningaloo Region | | 99.3 | 1.7 | 10.3 | 0.7 |
| Onslow Region | | 56.7 | 2.6 | NC | NC |
| Dampier Region | | 16.7 | 5.7 | NC | NC |
| Dampier Archipelago | | 23.3 | 12 | NC | NC |
| Barrow Island | | 60.7 | 2.4 | 1.8 | 3.5 |
| Hedland Region | | 14.7 | 23.9 | NC | NC |
| Montebello Islands | | 48.0 | 5.0 | 0.3 | 4.1 |
| Thevenard Island | | 36.0 | 7.2 | NC | NC |
| Imperieuse Reef | | 38.0 | 25.5 | NC | NC |
| Clerke Reef | | 22.0 | 33.1 | NC | NC |

**Table 2-5: Summary of Priority Monitoring Marine Parks & KEF Locations (Total Submerged [Entrained & Dissolved] Hydrocarbons)**

| Location (Marine Parks & KEF) | Receptor Types | Potential Exposure from LOWC (Crude) | | Potential Exposure from Vessel Collision (MDO) | |
|---|---|---|---|---|---|
| | | Probability of Contact % @ ≥10 ppb | Minimum time to Contact (Days) @ ≥10 ppb | Probability of Contact % @ ≥10 ppb | Minimum time to Contact (Days) @ ≥10 ppb |
| Ningaloo AMP | Water Quality.<br>Benthic Infauna.<br>Marine Mammals.<br>Benthic Habitats and Benthic Primary Producers.<br>Commercial and Recreational Fish Species.<br>Fishes. | 100 | 0.5 | 26.0 | 0.2 |
| Ningaloo MP | | 100 | 1.7 | 9.5 | 0.4 |
| Gascoyne AMP | | 100 | 0.4 | 58.8 | 0.2 |
| Abrolhos AMP | | 100 | 14.6 | NC | NC |
| Carnarvon Canyon AMP | | 98.7 | 10.3 | NC | NC |
| Shark Bay AMP | | 92.7 | 6.7 | NC | NC |
| Muiron Islands MP | | 90.7 | 1.2 | 3.3 | 0.8 |
| Agro-Rowley Terrace | | 76.7 | 15 | NC | NC |
| Montebello AMP | | 74.0 | 3.1 | 0.8 | 3.3 |
| Continental Slope Demersal Fish Communities KEF | | 100 | 0.1 | 93.8 | 0.1 |
| Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF | | 100 | 0.1 | 98.5 | 0.1 |
| Commonwealth waters adjacent to Ningaloo Reef KEF | | 100 | 0.5 | 26.0 | 0.2 |
| Exmouth Plateau KEF | | 100 | 2.2 | 13.3 | 2.3 |
| Western demersal slope and associated fish communities KEF | | 98.0 | 9.0 | NC | NC |

# 3 Relevant Sources of Existing Baseline Information

BHP has access to a number of different baseline data sources that are relevant to the high value receptors in the EMBA. These include:

- Industry-Government Environmental Metadata System (I-GEMS);

  The I-GEM Project is facilitated by the Australian Petroleum Production and Exploration Association (APPEA). The project is a collaborative approach between industry, marine research institutes and Western Australian government agencies to share metadata on quantitative ecological data for key receptors in the mid to northwest of WA (approximately from the Abrolhos Islands to the Timor Sea) and to represent these in a geospatial database.

- Australian Ocean Data Network (AODN);

  The Australian Oceans Data Network (AODN) is the primary access point for search, discovery, access and download of data collected by the Australian marine community. Data is presented as a regional view of all the data available from the Australian Ocean Data Network. Primary datasets are contributed to by Commonwealth Government agencies, State Government agencies, Universities, the Integrated Marine Observing System (IMOS) an Australian Government Research Infrastructure project, and the Western Australia Marine Science Institute (WAMSI).

- Western Australia Oil Spill Response Atlas (OSRA);

  The Western Australian Oil Spill Response Atlas (OSRA) is a spatial database of environmental, logistical and oil spill response data. Using a geographical information system (GIS) platform, OSRA displays datasets collated from a range of custodians allowing decision-makers to visualise environmental sensitivities and response considerations in a selected location. Oil spill trajectory modelling (OSTM) can be overlaid to assist in determining protection priorities, establishing suitable response strategies and identifying available resources for both contingency and incident planning. OSRA is managed by the Oil Spill Response Coordination unit within WA Department of Transport (DoT) Marine Safety and is part funded through the National Plan for Maritime Environmental Emergencies and the Australian Maritime Safety Authority (AMSA).

- The Atlas of Living Australia (ALA);

  The Atlas of Living Australia (ALA) is a collaborative, online, open resource that contains information on all the known species in Australia aggregated from a wide range of data providers. It provides a searchable database when considering species within the EMBA. The ALA receives support from the Australian Government through the National Collaborative Research Infrastructure Strategy (NCRIS) and is hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

- Environmental Sensitivities Exmouth Region (AOHSE-ER-0021-008); and

- North West Cape Sensitivity Mapping (AOHSE-ER-0036).

The following Australian Government management plans relate to receptors within the EMBA and identify their current condition. For example:

- Ningaloo Marine Park Management Plan (2004) 2005–2015, Management Plan No. 52. Department of Parks and Wildlife (DPAW), Perth, WA

- Department of Parks and Wildlife (2014) Eighty Mile Beach Marine Park Management Plan 2014–2024, Management Plan No. 80, DPaW, Perth, WA

- Barrow Island and Montebello Islands Management Plan (2007) 2007-2017, Management Plan No. 55. DPAW, Perth, WA

Further detail on protected species and ecological communities within the EMBA covered by species recovery plans is provided in Section 14. Additional information on protected species can be accessed via the following link: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowallrps.pl

Commercial and Recreation Fisheries baseline information can be accessed from the following sources:

- Commonwealth: https://www.afma.gov.au/
- WA State:
  - https://www.fish.wa.gov.au/Fishing-and-Aquaculture/Commercial-Fishing/Pages/default.aspx
  - https://www.wafic.org.au/
  - https://recfishwest.org.au/

Aboriginal Cultural Heritage baseline information:

Barrow Island, Montebello Islands, Exmouth, Ningaloo Reef, the Kimberley Coast, Eighty Mile Beach as well as the South West and the adjacent foreshores that are within the EMBA, have a long history of occupancy by Indigenous communities. A search through the Aboriginal Heritage Inquiry System (AHIS) as part of the development of the Pyrenees Phase 4 Infill Drilling Program EP determined that the coastal areas of the EMBA overlap with multiple registered Aboriginal Heritage Sites. Aboriginal heritage sites in WA are protected under the *Aboriginal Heritage Act 1972*, whether or not they are registered with the Department of Planning, Lands and Heritage (DPLH). While sea country is a recognised value, the registered site list contains only land-based sites. Areas that are covered by registered native title claims are likely to practice Indigenous fishing techniques at various sections of the WA coastline.

- The AHIS can be accessed here: https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-cultural-heritage/search-aboriginal-sites-or-heritage-places-ahis

# 4 Baseline Data Review

In addition to the baseline data detailed in Section 3, Appendix A: Baseline Data Sources details other relevant baseline data sources.

BHP has also funded a collection of extensive baseline datasets on benthic habitats in the Ningaloo Marine Park using hyperspectral data (bottom reflectance) at 3.5 x 3.5 m pixel resolution (Kobryn *et al*., 2011). The authors of this study stated that “Globally, this data set is one of the most extensive for a coral reef system and covers over 300 km of coastline, extending seamlessly from the 20 m depth contour to 2 km inland.” Overall, the majority of benthic cover in the Ningaloo Marine Park comprises macroalgal and turfing algae communities (54%), while hard and soft coral cover (>10% per pixel) represents only 7% of the mapped area (762 km$^2$). In terms of spatial distribution, Turquoise Bay had the largest proportion of coral cover and Gnaraloo the least (Kobryn *et al*., 2011). Mapping of coastal habitats found there was a distinct difference in vegetation cover from south to the north of the Ningaloo Marine Park, where majority of live shrubs and trees occurred in the northern section of the study area (6,556 km$^2$). Live shrubs and trees along the coast comprise 0.29% to 6.5% of the study area. Shrubs and trees were mostly confined to drainage channels with two small areas of mangroves identified at Mangrove Bay (Kobryn *et al*., 2011). In summary, the hyperspectral habitat mapping project demonstrates that it is possible to map coral reef and adjacent coastal habitats over large areas such as the Ningaloo Marine Park using remote sensing techniques, and provides evidence of BHP’s commitment to understanding the environment in which it operates.

Additional turtle baseline data can be sourced from the Ningaloo Turtle Program, established in 2002 as a collaboration between the Cape Conservation Group Inc., World Wildlife Fund Australia, Murdoch University and the predecessors of the Parks and Wildlife Service at the Department of Biodiversity Conservation and Attractions, Exmouth District. The Ningaloo Turtle Program aims to understand long-term trends in marine turtle populations within the Ningaloo Marine Park, through the collection of turtle nesting information, including nesting abundance and nesting success at various locations throughout the Ningaloo Marine Park. In summary, data from these partnerships would be used in baseline comparisons to measure the effects, if any, of oil spilt on sensitive receptors in the Ningaloo Marine Park.

BHP has evaluated the baseline data relevant to the high value receptors in the EMBA and reviewed this baseline information to assess the spatial and temporal relevance of this data and comparison of methods and parameters to those outlined in the Joint Industry SMPs. This review focused on priority monitoring locations with a minimum hydrocarbon contact timeframe of less than seven days for the worst-case spill.

The criteria used during the baseline data review is outlined in Table 4-1.

**Table 4-1: Assessment Criteria for Baseline Data Review**

| Year of Most Recent Data Capture | Duration of Monitoring Program | Frequency of Data Capture | Similarity of Methods to Joint Industry SMP | Similarity of Parameters to Joint Industry SMP |
|---|---|---|---|---|
| **High = 2015-2021** | High = >4 years | High = 4+ sampling trips per year | High | High |
| **Medium = 2010-2015** | Medium = 2-4 years | Medium = 2-3 sampling trips per year | Medium | Medium |
| **Low = 2010** | Low = <2 years | Low = one-off sampling trip | Low | Low |

This assessment was then used to determine if the available baseline data could be used to detect change in receptors at priority monitoring locations in the event of a significant oil spill, compares priority monitoring locations and receptors, and provides guidance on where post-spill, pre-impact monitoring should be prioritised.

The different categories listed include:

- Not applicable (N/A) – this receptor and relevant SMP is not applicable to the priority monitoring location (i.e. shoreline habitat not present at submerged shoals);
- Survey – Current monitoring/knowledge is considered sufficient (i.e. could be used to detect level of change in the event of a significant impact) and is considered a lower priority for post-spill, pre-impact data collection; and
- Priority survey – Current monitoring/knowledge is not in place, not suitable or not practicable; and post-spill pre-impact baseline data collection should be prioritised.

It is noted that it is difficult to obtain absolute statistical proof of oil spill impacts, due to the variability (spatially and temporally) of the natural environment, the lack of experimental control due to the nature of spills and because suitable baseline data may not be available (Kirby *et al*., 2018). Alternative approaches exist for detecting impacts where post-spill, pre-impact monitoring may not be feasible. These include impact versus control design approaches and/or a gradient approach. The Joint Industry OSMP Framework (APPEA, 2020a) provides guidance and considerations for survey designs to enable the acquisition of sufficiently powerful data during SMP implementation.

Once SMP monitoring reports are drafted (post-spill) they should be peer reviewed by an expert panel (refer to Section 20).

A summary of baseline data assessment results and recommended priority monitoring locations versus SMPs is presented below in Table 4-2.

**Table 4-2: Recommended Priority Monitoring Locations versus SMPs**

| Priority Monitoring Locations | Water Quality Impact Assessment | Sediment Quality Impact Assessment | Intertidal Coastal Habitat Assessment | Seabirds and Shorebirds | Marine Megafauna Assessment | Marine Reptiles Assessment | Benthic Habitat Assessment | Marine Fish Assessment | Fisheries Impact Assessment | Heritage and Social Impact Assessment |
|---|---|---|---|---|---|---|---|---|---|---|
| **Marine Parks (surface hydrocarbon exposure)**<br>Gascoyne AMP<br>Ningaloo AMP<br>Muiron Islands MP<br>Montebello AMP<br>Barrow Island MP<br>Carnarvon Canyon AMP<br>Agro-Rowley Terrace AMP<br>Thevenard Island MP | Priority Survey | N/A | N/A | Survey | Survey | Survey | N/A | Survey | Priority Survey (Locations to be determined in consultation with key stakeholders to reflect current fishing zones/effort) | Priority Survey (Locations to be determined in consultation with key stakeholders) |
| **Geographic Features (Shoreline exposure)**<br>Muiron Islands<br>Ningaloo Region<br>Onslow Region<br>Dampier Region<br>Dampier Archipelago<br>Barrow Island<br>Hedland Region<br>Montebello Islands<br>Thevenard Island<br>Imperieuse Reef<br>Clerke Reef | Survey | Priority Survey | Priority Survey | Priority Survey | N/A | Priority Survey | N/A | N/A | | |
| **Marine Parks & KEFs (submerged hydrocarbon exposure)**<br>Ningaloo AMP<br>Ningaloo MP<br>Gascoyne AMP<br>Abrolhos AMP<br>Carnarvon Canyon AMP<br>Shark Bay AMP<br>Muiron Islands MP<br>Agro-Rowley Terrace<br>Montebello AMP<br>Continental Slope Demersal Fish Communities KEF<br>Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF<br>Commonwealth waters adjacent to Ningaloo Reef KEF<br>Exmouth Plateau KEF<br>Western demersal slope and associated fish communities KEF | Priority Survey | Survey | N/A | Suvey | Survey | Survey | Survey | Survey | | |

# 5 IMT (OSM) Organisational Structure

As detailed within the BHP Incident Management Plan – Australia (AOHSE-ER-0001) BHP uses the Incident Command System (ICS) to respond to incidents and therefore adopts the key roles and responsibilities used in this system, as described in the activity EPs and/or OPEPs. The Incident Management Team (IMT) will be responsible for coordinating OSM activities, which will be led by the Planning Section within the IMT, with support from each Section, in particular the Operations Section.

The BHP IMT structure is shown in Figure 5-1. Where the WA DoT is the Controlling Agency, the IMT will be managed through coordinated command and BHP will still be expected to continue monitoring activities in Western Australian waters, with oversight from WA DoT.

Figure 5-2 illustrates the structure of the OSM Management Team during the response phase. The IMT Incident Commander is ultimately accountable for managing the response operation, which includes this plan. Depending on the scale of the event, individual people may perform multiple roles; similarly, multiple people may share the same role.

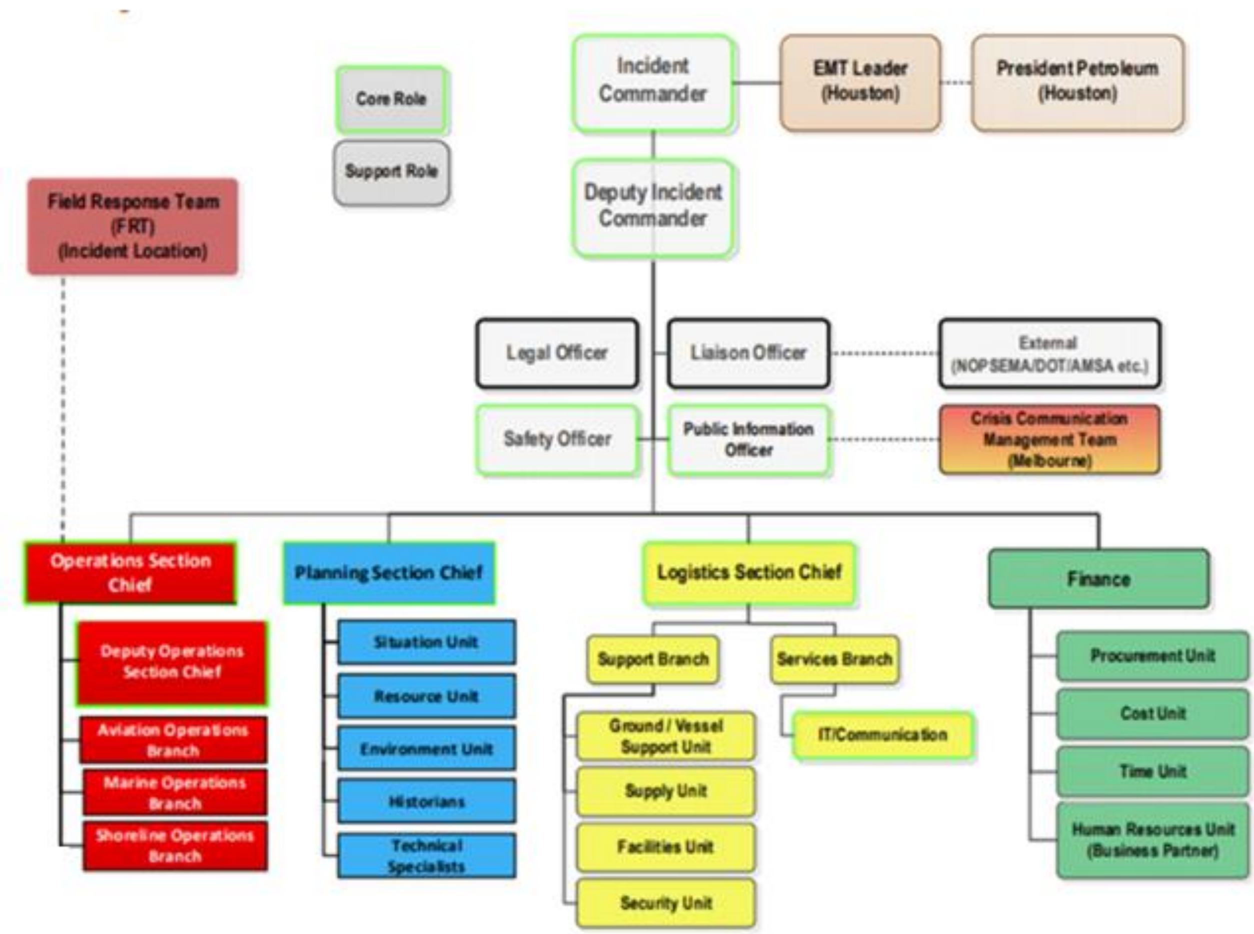



**Figure 5-1: APU IMT Organisational Chart**

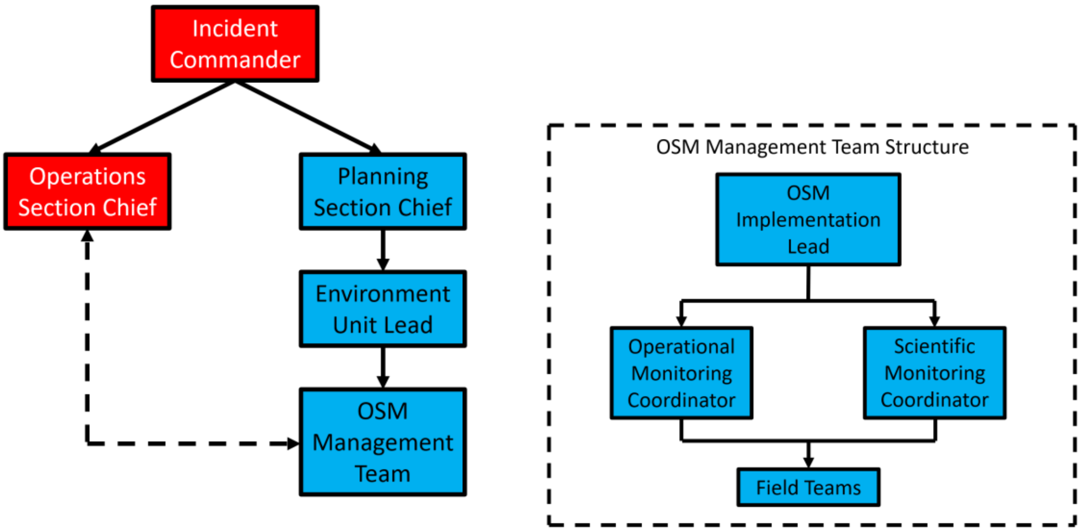



Figure 5-2: APU IMT with OSM Management Team

# 6 OSM Roles and Responsibilities

Table 6-1 outlines the roles held by BHP and the OSM Service Providers within the OSM Management Team. Table 6-2 outlines the responsibilities of the OSM roles.

During the post-response phase, the BHP EUL (or delegate) and the OSM Service Provider OSM Implementation Lead will continue to be responsible for the coordination and delivery of monitoring plans.

**Table 6-1: OSM Roles (BHP and Service Providers)**

| Role | Position Held By |
|---|---|
| Environment Unit Lead (EUL) | BHP Principal (Environment & Regulatory) HSE (or delegate) |
| OSM Implementation Lead | OSM Service Provider |
| Operational Monitoring Coordinator and Scientific Monitoring Coordinator | OSM Service Provider |
| OSM Field Operations Manager | OSM Service Provider |
| OSM Field Teams | OSM Service Providers |

**Table 6-2: Roles and Responsibilities for OSM**

| Role | Key Responsibilities |
|---|---|
| **Planning Section Chief (BHP)** | Ultimately accountable to the IC for the implementation of the OSMP. Specific responsibilities to the OSMP include:<br>• Ensure OSMP-specific roles are established<br>• Integrate operational and scientific monitoring with the spill response<br>• Ensure that OMP and SMP components are implemented according to their specific initiation criteria and within nominated response times<br>• Ensure that the OSM implementation lead and environment unit lead (EUL) are sufficiently resourced to oversee and guide implementation of OSMP activities |
| **Environment Unit Lead (EUL) (BHP)** | The EUL is the key position for relaying information between the IMT and the OSMP implementation lead. Key OSMP responsibilities include:<br>• Mobilise OSMP Service Provider<br>• Validate protection and monitoring priorities<br>• Validate strategic SIMA to generate the initial operational SIMA<br>• Main point of contact between IMT and OSMP Service Provider<br>• Provide overarching technical advice<br>• Analysing data received from monitoring teams (this task may be delegated to OSMP management team) and ensuring the information is incorporated into the current/next operating periods IAP<br>• Advise on environmental impact from implementing monitoring<br>• Management of scientific monitoring components once spill response operation is terminated<br>• Disseminating monitoring information to the Situation Unit Lead (SUL within the Planning Section |
| **OSMP Implementation Lead (OSM Service Provider)** | Responsible for overseeing implementation of OMP and SMP components in accordance with this Plan, specifically identify:<br>• The relevant OMP and SMP components that may be triggered based on the information collected during the initial response and OMP monitoring<br>• Implementation of response options to ensure that the relevant OMP and SMP components are implemented at the appropriate times<br>• Liaise with BHP EUL for advice on scientific monitoring components<br>• Approve sampling and analysis plans for the SMP components within the nominated time frame of the SMP component being triggered<br>• Ensure mobilisation of resources for sampling and analysis plans within the nominated time frame of the SMP component being triggered<br>• Liaise with relevant stakeholders and regulators on monitoring design, monitoring priorities, and results via the BHP Liaison Officer (LO) |
| **Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSM Service Provider)** | The Operational Monitoring Coordinator and Scientific Monitoring Coordinator are the technical leads for each monitoring type. Responsibilities include:<br>• Finalise monitoring design for individual OMPs and/or SMPs<br>• Understand the data metrics collected in the event of a spill<br>• Advise the OSMP Implementation Lead on data collection, logistical support required, and monitoring priorities if constraints (e.g. safety, time, logistics) are encountered<br>• Oversee data analyses and interpretation<br>• Manage data, including spatial data<br>• Present data in an appropriate and informative format to allow for timely decisions |

| Role | Key Responsibilities |
|---|---|
| **OSMP Field Operations Manager (OSM Service Provider)** | Responsible of the coordination of resources and developing a schedule of movements, in close consultation with the IMT Logistics Section. Key responsibilities include:<br>• Determine locations where monitoring teams are required and resource requirements for specific locations<br>• Keep track of vessel/aerial movements associated with monitoring activities<br>• Monitor resource availability<br>• Direct communications with relevant monitoring coordinator and field team leads<br>• Monitor and coordinate simultaneous operations |
| **OSMP Field Teams (OSM Service Provider)** | A field team includes one Field Team Lead, who is the key contact point to the relevant monitoring coordinator during field deployment. The responsibilities of all field team members include:<br>• Understand the details of monitoring methods<br>• Ensure that they are supplied with adequate equipment and field data collection sheets to undertake the monitoring equipment<br>• Ensure awareness and understanding of the QA/QC procedures<br>• Help with report preparation if required |

# 7 Mobilisation and Timing of OMP and SMP Implementation

The time it takes to mobilise and implement each OMP and SMP will vary according to the spill risk profile, proximity of the spill to sensitive receptors, mobilisation constraints and logistical requirements. Table 7-1 provides an indicative implementation schedule for OMP and SMPs within the EMBA and adjacent waters. The locations listed are aligned to the initial monitoring priorities described in Section 2.

Note: 'Initiation' means that the monitoring plan has been triggered and the IMT/Monitoring Provider has commenced finalisation of the plan including implementation of the following actions (which may take 48-72 hours to complete all actions):

- Activate internal OSMP personnel and external contracts
- Select/confirm monitoring sites
- Finalise sampling techniques and sampling analysis plans
- Determine suitable sampling frequency
- Finalise standard operating procedures
- Allocate number of teams, personnel, equipment and supporting resource requirements
- Finalise Health, Safety and Environment (HES) documentation prior to mobilisation of field teams
- Confirm logistics (e.g. flights, accommodation, vessels)
- Commence deployment of field teams.

For SMPs:

- Gather existing baseline data and/or establish control/reference sites

- Establish benchmarks and guidelines to be used
- Confirm indicator species
- Confirm parameters and metrics.

Table 7-1 provides an indicative implementation schedule for OMP and SMPs in the EMBA and adjacent waters. The locations listed are aligned to the initial monitoring priorities described in Section 2.

**Table 7-1: Indicative OMP and SMP Implementation Schedule for OSM Activities if Initiation Criteria are met**

| Priority Monitoring Locations | Monitoring Type | 0-48 Hours | 2-4 Days | 5-10 Days | >2 weeks |
|---|---|---|---|---|---|
| **Offshore waters adjacent to release location**<br><br>**Marine Parks (surface hydrocarbon exposure)**<br>Gascoyne AMP<br>Ningaloo AMP<br>Muiron Islands MP<br>Montebello AMP<br>Barrow Island MP<br>Carnarvon Canyon AMP<br>Agro-Rowley Terrace AMP<br>Thevenard Island MP | OM | Activation of OMP team leads.<br><br>Initiation of OMP RS2:<br>• Vessel Surveillance<br>• Aerial Surveillance (AOHSE-ER-0041)<br>• Oil Spill Trajectory Modelling (AOHSE-ER-044)<br>• OSTB Deployment (AOHSE-ER-0033)<br><br>Initiation of dispersant efficacy and monitoring: RS3 Marine Dispersants (AOHSE-ER-0055) | Continue to undertake water sampling and dispersant monitoring | Initiation of: API Technical Report 1152: Industry Recommended Subsea Dispersant Monitoring Plan 2020<br><br>Continue to activate and mobilise OM personnel | As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met. |
| | SM | Commence activation and mobilisation process.<br>Activation of SMP team leads.<br>Initiation of:<br>• SMP: Water Quality, Sediment Quality, and Benthic Infauna (AOHSE-ER-0037) | Initiation of:<br>• SMP: Shorebirds and Migratory Birds (AOHSE-ER-0038)<br>• SMP: Marine Mammals and Megafauna (AOHSE-ER-0039)<br>• SMP: Marine Reptiles (AOHSE-ER-0043)<br>• SMP: Fishes (AOHSE-ER-0051)<br>• SMP: Commercial and Recreational Fish Species (AOHSE-ER-0048) | Continue SMP monitoring until termination criteria are met. | Continue SMP monitoring until termination criteria are met. |
| **Geographic Features (Shoreline exposure)**<br>Muiron Islands<br>Ningaloo Region<br>Onslow Region<br>Dampier Region | OM | Activation of OMP team leads.<br><br>Finalise OMPs<br><br>Initiation of OMP RS2: | • OMP: RS2: Oil Spill Trajectory Modelling (AOHSE-ER-044)<br>• OMP: RS2: Satellite Imagery | Continue to activate and mobilise OM personnel | As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning |

| Priority Monitoring Locations | Monitoring Type | 0-48 Hours | 2-4 Days | 5-10 Days | >2 weeks |
|---|---|---|---|---|---|
| Dampier Archipelago<br>Barrow Island<br>Hedland Region<br>Montebello Islands<br>Thevenard Island<br>Imperieuse Reef<br>Clerke Reef | | • Aerial Surveillance (AOHSE-ER-0041)<br>• BHP RS5 Shoreline Protection (AOHSE-ER-0057) including SCAT<br>• BHP Aboriginal Heritage Procedures (reference BHP MEMO HER A1000) activated by BHP Heritage Team. | | | process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met. |
| | SM | Commence activation and mobilisation process.<br>Activation of SMP team leads.<br>Initiation of:<br>• SMP: Water Quality, Sediment Quality, and Benthic Infauna (AOHSE-ER-0037)<br>• SMP: Shorebirds and Migratory Birds (AOHSE-ER-0038)<br>• SMP: Marine Reptiles (AOHSE-ER-0043) | Initiation of:<br>• SMP: Commercial and Recreational Fish Species (AOHSE-ER-0048) | Continue SMP monitoring until termination criteria are met. | Continue SMP monitoring until termination criteria are met. |
| **Marine Parks & KEFs (submerged hydrocarbon exposure)**<br>Ningaloo AMP<br>Ningaloo MP<br>Gascoyne AMP<br>Abrolhos AMP<br>Carnarvon Canyon AMP<br>Shark Bay AMP<br>Muiron Islands MP<br>Agro-Rowley Terrace<br>Montebello AMP | OM | Initiation of OMP RS2:<br>Vessel Surveillance<br>Aerial Surveillance (AOHSE-ER-0041)<br>Oil Spill Trajectory Modelling (AOHSE-ER-044)<br>Activation of OMP team leads.<br>Finalise OMPs. | • Aerial Surveillance (AOHSE-ER-0041)<br>• Oil Spill Trajectory Modelling (AOHSE-ER-044) | As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met. | As results from implemented OMPs are available, data is provided to relevant personnel in IMT (Situation Unit Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met. |

| Priority Monitoring Locations | Monitoring Type | 0-48 Hours | 2-4 Days | 5-10 Days | >2 weeks |
|---|---|---|---|---|---|
| Continental Slope Demersal Fish Communities KEF<br>Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF<br>Commonwealth waters adjacent to Ningaloo Reef KEF<br>Exmouth Plateau KEF<br>Western demersal slope and associated fish communities KEF | SM | Commence activation and mobilisation process.<br>Activation of SMP team leads.<br>Initiation of:<br>SMP: Water Quality, Sediment Quality, and Benthic Infauna (AOHSE-ER-0037) | Initiation of:<br>• SMP: Shorebirds and Migratory Birds (AOHSE-ER-0038)<br>• SMP: Marine Mammals and Megafauna (AOHSE-ER-0039)<br>• SMP: Marine Reptiles (AOHSE-ER-0043)<br>• SMP: Fishes (AOHSE-ER-0051)<br>• SMP: Commercial and Recreational Fish Species (AOHSE-ER-0048) | Continue SMP monitoring until termination criteria are met. | Continue SMP monitoring until termination criteria are met. |

# 8 Resource Requirements

The resources required to assist the IMT in the coordination and management of OSM are outlined in Table 8-1. The resources required to implement operational and scientific monitoring components are presented in Table 8-2 and Table 8-3 respectively, which is based on the monitoring priorities in Section 2 and implementation schedule outlined in Table 7-1. This assessment is based on a LOWC scenario (crude oil) in the Pyrenees Field. It should be noted that a single spill will not contact all locations and receptors listed Table 7-1.

**Table 8-1: Resources Required for Key OSM Coordination Roles**

| Role | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| **OSM Implementation Lead (OSM Service Provider)** | 1 x Principal Scientist | 1 x Principal Scientist | 1 x Principal Scientist | OSM Service Provider Service Level Agreement |
| **Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSM Service Provider)** | 2 x Principal Scientists | 2 x Principal Scientists | 2 x Principal Scientists | |
| **OSM Field Operations Manager (OSM Service Provider)** | 1 x Senior Scientist | 1 x Senior Scientist | 1 x Senior Scientist | |

**Table 8-2: Indicative Resources Required for Implementation of Operational Monitoring Plans**

| OMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| **Hydrocarbon properties and weathering behaviour at sea*** **BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)** | 1 team (spill site and surrounds)<br><br>1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Onslow Region)<br><br>1 team (Barrow Island) | 1 team (spill site and surrounds)<br><br>1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Onslow Region)<br><br>1 team (Barrow Island) | 1 team (spill site and surrounds)<br><br>1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Onslow Region)<br><br>1 team (Barrow Island) | BHP have a Service Level Agreement with a NATA accredited laboratory<br><br>BHP have a Service Level Agreement with OSM Service Provider |

| OMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| | 1 team (Montebello Islands)<br><br>Total 6 team leaders and 18 team members (3 per team) | 1 team (Montebello Islands)<br><br>Total 6 team leaders and 18 team members (3 per team)<br><br>Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered. | 1 team (Montebello Islands)<br><br>Total 6 team leaders and 18 team members (3 per team) | Contract includes provision of equipment |
| **Shoreline clean-up assessment**<br>**BHP RS5 Shoreline Protection (AOHSE-ER-0057)** | 1 team (Yardie Creek)<br><br>1 team (Turquoise Bay)<br><br>1 team (Mangrove Bay)<br><br>1 team (Jurabi Point to Lighthouse beaches)<br><br>1 team (Muiron Islands)<br><br>Total 5 team leaders and 10 team members (2 per team) | 1 team (Yardie Creek)<br><br>1 team (Turquoise Bay)<br><br>1 team (Mangrove Bay)<br><br>1 team (Jurabi Point to Lighthouse beaches)<br><br>1 team (Muiron Islands)<br><br>Additional teams/s (various locations as required – assume 3x)<br><br>Total 8 team leaders and 16 team members (2 per team) | 1 team (Yardie Creek)<br><br>1 team (Turquoise Bay)<br><br>1 team (Mangrove Bay)<br><br>1 team (Jurabi Point to Lighthouse beaches)<br><br>1 team (Muiron Islands)<br><br>Additional teams/s (various locations as required – assume 3x)<br><br>Total 8 team leaders and 16 team members (2 per team) | AMOSCPlan (BHP is AMOSC member)<br><br>OSRL (BHP has Service Level Agreement)<br><br>WA DoT (Controlling Agency) has 3x SCAT team capability |
| **Surface chemical dispersant effectiveness and fate**<br>**BHP RS3 Marine Dispersants (AOHSE-ER-0055)** | 1 team leader<br><br>1 team member (for visual observations, which may be performed by trained aerial observers used during monitor and evaluate if trained in observation and verification of | 1 team leader<br><br>1 team member (for visual observations, which may be performed by trained aerial observers used during monitor and evaluate if trained in observation and verification of | 1 team leader<br><br>1 team member (for visual observations, which may be performed by trained aerial observers used during monitor and evaluate if trained in observation and verification of | AMOSCPlan (BHP is AMOSC member)<br><br>OSRL (BHP has Service Level Agreement)<br><br>BHP have a Service Level Agreement with a NATA accredited laboratory |

| OMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| | chemical dispersant effectiveness)<br><br>For water quality observations, refer to Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037) | chemical dispersant effectiveness)<br><br>For water quality observations, refer to Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)<br><br>Additional teams/s (various locations as required) | chemical dispersant effectiveness)<br><br>For water quality observations, refer to Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037) | |
| **Subsea dispersant injection (SSDI) monitoring (BHP adopt the API Technical Report 1152: Industry Recommended Subsea Dispersant Monitoring Plan 2020)**<br><br>**https://www.oilspillprevention.org/-/media/Oil-Spill-Prevention/spillprevention/r-and-d/dispersants/api-1152-e1-industry-recommended-subsea.pdf** | No subsea dispersant injection until week 2 due to transportation requirements | 12 hour/day operation<br><br>1 team leader/operations manager<br><br>11 team members<br><br>24 hour/day operation<br><br>2 team leaders/operations manager<br><br>16 team members | 12 hour/day operation<br><br>1 team leader/operations manager<br><br>11 team members<br><br>24 hour/day operation<br><br>2 team leaders/operations manager<br><br>16 team members | BHP has a Service Level Agreement with OSRL, therefore has access to Subsea Intervention Response Toolkit (SIRT) including access to dedicated monitoring equipment. Under the OSRL Service Level Agreement a framework agreement enables the CSA Ocean Sciences to provide monitoring services. |
| **Water quality assessment BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)** | Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites) | Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites) | Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)<br><br>Additional teams, if required (dependent upon any modifications to sampling locations, frequency etc.) | BHP have a Service Level Agreement with a NATA accredited laboratory |

| OMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| **Sediment quality assessment*** **BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)** | Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites) | Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites) | Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)<br><br>Additional teams, if required (dependent upon any modifications to sampling locations, frequency etc.) | BHP have a Service Level Agreement with a NATA accredited laboratory<br><br>BHP have a Service Level Agreement with OSM Service Provider<br><br>Contract includes provision of equipment |
| **Marine fauna assessment** **BHP Incident Action Plan – Marine Mammals and Megafauna (AOHSE-ER-0039)** | 1 team to conduct initial aerial surveys for spill site, Site A, Site B, Site C (2 observers per aircraft) Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered. | If vessel based surveys selected:<br><br>1 team (spill site and surrounds)<br><br>1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Onslow Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 6 team leaders and 18 team members (3 per team) | If vessel based surveys selected:<br><br>1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Onslow Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 6 team leaders and 18 team members (3 per team) | BHP have a Service Level Agreement with OSM Service Provider<br><br>Contract includes provision of equipment |
| **Air quality monitoring (responder health and safety)**<br><br>**BHP Petroleum First Responder Air Monitoring Work Plan (11203437)** | 1 team (onshore)<br><br>1 team (offshore) | 1 team (onshore)<br><br>1 team (offshore) | 1 team (onshore)<br><br>1 team (offshore) | Internal BHP HSE Specialists |

* Initial co-mobilisation between OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate, OMP: Water quality assessment and OMP: Sediment quality assessment

Table 8-3: Indicative Resources Required for Implementation of Scientific Monitoring Plans

| SMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| **Water quality assessment**<br>**BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)** | 1 team (spill site and surrounds)<br>1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Onslow Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 6 team leaders and 18 team members (3 per team) | 1 team (spill site and surrounds)<br>1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Onslow Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 6 team leaders and 18 team members (3 per team)<br>Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered. | 1 team (spill site and surrounds)<br>1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Onslow Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 6 team leaders and 18 team members (3 per team) | BHP have a Service Level Agreement with a NATA accredited laboratory<br>BHP have a Service Level Agreement with OSM Service Provider<br>Contract includes provision of equipment<br>Marine Contractors via vessel brokerage |
| **Sediment quality assessment**<br>**BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)** | Refer to SMP: Water quality assessment* (all sites) | Refer to SMP: Water quality assessment* (all sites) | Refer to SMP: Water quality assessment* (all sites) | BHP have a Service Level Agreement with a NATA accredited laboratory<br>BHP have a Service Level Agreement with OSM Service Provider<br>Contract includes provision of equipment<br>Marine Contractors via vessel brokerage<br>Aviation contract with CHC Helicopter |

| SMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| **Intertidal and coastal habitat assessment** **BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)** | 1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Onslow Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 5 team leaders and 15 team members (3 per team) | 1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Onslow Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 5 team leaders and 15 team members (3 per team) | 1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Onslow Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 6 team leaders and 15 team members (3 per team) | BHP have a Service Level Agreement with a NATA accredited laboratory<br>BHP have a Service Level Agreement with OSM Service Provider<br>Contract includes provision of equipment<br>Marine Contractors via vessel brokerage |
| **Seabirds and Shorebirds BHP Incident Action Plan – Seabirds and Migratory Shorebirds (AOHSE-ER-0038)** | 1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 4 team leaders and 12 team members (3 per team)<br>Note: Can initially be performed by the same team as OMP: Marine fauna assessment – seabirds and shorebirds. This SMP may replace OMP: Marine fauna assessment – seabirds and shorebirds if the OMPs termination criteria are triggered | 1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 4 team leaders and 12 team members (3 per team) | 1 team (Muiron Islands)<br>1 team (Ningaloo Region)<br>1 team (Barrow Island)<br>1 team (Montebello Islands)<br>Total 4 team leaders and 12 team members (3 per team) | BHP have a Service Level Agreement with Bennelongia Environmental Consultants<br>BHP have a Service Level Agreement with OSM Service Provider<br>Contract includes provision of equipment<br>Marine Contractors via vessel brokerage<br>Aviation contract with CHC Helicopter |
| **Marine fauna assessment** **BHP Incident Action Plan – Marine mammals and Megafauna (AOHSE-ER-0039)** | 1 team to conduct initial aerial surveys for spill site, Muiron Islands, Ningaloo Region, Montebello Islands, and Barrow Island | If vessel based surveys selected:<br>1 team (Muiron Islands) | If vessel based surveys selected:<br>1 team (Muiron Islands) | BHP have a Service Level Agreement with OSM Service Provider |

| SMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| | Total 2 team leaders and 6 team members (4 per team). Note: Can initially be performed by the same team as the relevant OMP: Marine fauna assessment. This SMP may replace the relevant OMP: Marine fauna assessment if the OMPs termination criteria are triggered | 1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team) | 1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team) | Contract includes provision of equipment<br><br>Marine Contractors via vessel brokerage<br><br>Aviation contract with CHC Helicopter |
| **Marine reptiles (turtles) assessment**<br>**BHP Incident Action Plan – Marine Reptiles (AOHSE-ER-0043)** | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team). Note: Can initially be performed by the same team as OMP: Marine fauna assessment – seabirds and shorebirds. | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team) | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team) | BHP have a Service Level Agreement with OSM Service Provider<br><br>Contract includes provision of equipment<br><br>Marine Contractors via vessel brokerage<br><br>Aviation contract with CHC Helicopter |
| **Benthic habitat assessment**<br>**BHP Incident Action Plan – Benthic Habitats and Benthic Primary Producers (AOHSE-ER-0040)** | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team) | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team) | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>Total 4 team leaders and 12 team members (3 per team) | BHP have a Service Level Agreement with a NATA accredited laboratoryBHP have a Service Level Agreement with OSM Service Provider<br><br>Contract includes provision of equipment<br><br>Marine Contractors via vessel brokerage |

| SMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| **Marine fish and elasmobranch assemblages assessment**<br>**BHP Incident Action Plan – Effects of an Oil Spill on Fishes (AOHSE-ER-0051)** | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>1 team (Onslow Region)<br><br>1 team (Dampier Region + Archipelago)<br><br>Total 6 team leaders and 18 team members (3 per team)<br><br>Note: can initially be performed by the same team as OMP: Marine fauna assessment – fish.<br><br>This SMP may replace OMP: Marine fauna assessment – fish if the OMPs termination criteria are triggered | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>1 team (Onslow Region)<br><br>1 team (Dampier Region + Archipelago)<br><br>Total 6 team leaders and 18 team members (3 per team) | 1 team (Muiron Islands)<br><br>1 team (Ningaloo Region)<br><br>1 team (Barrow Island)<br><br>1 team (Montebello Islands)<br><br>1 team (Onslow Region)<br><br>1 team (Dampier Region + Archipelago)<br><br>Total 6 team leaders and 18 team members (3 per team) | BHP have a Service Level Agreement with OSM Service Provider<br><br>Contract includes provision of equipment<br><br>Marine Contractors via vessel brokerage |
| **Fisheries impact assessment**<br>**BHP Incident Action Plan – Commercial and Recreational Fish Species (AOHSE-ER-0048)** | 2 teams (Commonwealth fisheries with the potential to be impacted/are being impacted<br><br>Total 2 team leaders and 4 team members (3 per team)<br><br>Note: Can initially be performed by the same team as OMP: Marine fauna assessment – fish.<br><br>This SMP may replace OMP: Marine fauna assessment – fish | 3 teams (Commonwealth fisheries with the potential to be impacted/are being impacted<br><br>Total 3 team leaders and 6 team members (3 per team) | 4 teams (Commonwealth fisheries with the potential to be impacted/are being impacted<br><br>Total 4 team leaders and 8 team members (3 per team) | BHP have a Service Level Agreement with a NATA accredited laboratory<br><br>BHP have a Service Level Agreement with OSM Service Provider<br><br>Contract includes provision of equipment<br><br>Marine Contractors via vessel brokerage |

| SMP | Week 1 (total) | Week 2 (total) | Week 3 (total) | Arrangement |
|---|---|---|---|---|
| | if the OMPs termination criteria are triggered | | | |
| **Heritage features assessment** **BHP Aboriginal Heritage Procedures (reference BHP MEMO HER A1000) activated by BHP Heritage Team** | 1 team<br><br>Total 1 team leader and 2 team members (3 per team) | 1 team<br><br>Total 1 team leader and 2 team members (3 per team) | 1 team<br><br>Total 1 team leader and 2 team members (3 per team) | Internal BHP Heritage Team |

* Initial co-mobilisation between OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate, OMP: Water quality assessment and OMP: Sediment quality assessment

# 9 Capability Arrangements

BHP maintains a list of pre-approved vendors (OSM Service Providers) who can be called upon at short notice to provide environmental monitoring services in the evnt of an oil spill.

The BHP Contractor Assurance Program is managed through 1SAP (Maintenance Plan No. 30828237). The scope of the assurance program is to ensure completion of the annual OPEP contractor capability assessment to meet the requirement to maintain oil spill preparedness. Maintenance Plan Task 1.3 includes contacting environmental monitoring vendors to obtain information about personnel, location, qualifications and skill set. In addition, Maintenance Plan No. 30884994 includes a quarterly verbal check with each vendor about availability to mobilise in the event of an oil spill to meet the requirements environmental monitoring.

BHP has a Service Level Agreement (SLA) with OSRL under which a framework agreement enables CSA Ocean Sciences to provide in-field SSDI monitoring services.

## 9.1 Personnel Competencies

BHP OSM Service contract specifies the competency requirements for key OSM personnel, including the provision of appropriately qualified and trained contractor personnel. The contracted OSM Service Provider supplies BHP an annual skills / qualifications matrix with available response personnel. All personnel hold relevant tertiary qualifications and trainings includes sampling design (analytical approaches / marine sampling / estuarine sampling / vessel sampling / shoreline sampling / benthic fauna ID) and other relevant qualifications.

Where the key OSM role is held by the Titleholder, BHP Environment Principals / IMT EULs hold relevant tertiary qualifications, minimum 10+ years industry experience in environmental management, CEM training (ICS 100 & 200) and/or AMOSC IMO2, and knowledge of BHP Monitoring Procedures / activity-specific OPEPs.

In addition and where practicable, BHP will engage its most qualified local environment advisors in the initial stages of the monitoring program to help activate and mobilise monitoring teams and support the OSM Service Provider in the finalisation of monitoring designs.

## 9.2 Equipment

Equipment requirements are listed in the individual OMPs and SMPs. A generalised breakdown of equipment types and the source is listed in Table 9-1.

In accordance with the OSM services contract, the OSM Service Provider will provide all specialised field monitoring equipment to implement individual OMPs and SMPs. BHP will remain responsible for support and field logistics, including monitoring platforms (e.g. vessels, vehicles and aircraft), flights and accommodation for personnel and transportation/couriers for samples to be sent back to laboratories.

Availability of field equipment will be listed in the OSM Service Provider's Standby Capability and Competency Report.

**Table 9-1: OSM Equipment**

| Equipment Type | Source |
|---|---|
| **Desktop equipment (e.g. Oil Spill Response Atlas, GIS)** | Coordinated through BHP IMT GIS Team |
| **In-field specialised monitoring equipment (e.g. fluorometers, sample bottles, ROVs)** | Coordinated through the OSMP Service Provider's standby OSMP response and implementation services, including:<br>OSRL Service Level Agreement;<br>OSM Service Providers |

| | |
|---|---|
| | ROV capability via BHP |
| **Logistical equipment (e.g. in-field accommodation, vessels, aircraft)** | Coordinated via BHP IMT (Logistics Section Chief) |

## 9.3 Exercises

BHP maintains Crisis and Emergency (CEM) metrics updated quarterly to ensure its competency in responding to and managing major incidents, including oil spills.

BHP conducts a number of different exercise types that may include a component of operational and scientific monitoring, which are outlined in Table 9-2.

**Table 9-2: Exercise Types**

| Exercise Type | Description | Frequency |
|---|---|---|
| **Notification Exercise** | Test procedures to notify and activate the IMT, oil spill response organisations, third-party providers (including OSM Service Providers) and regulators | Prior to undertaking a new offshore activity; or<br>At least annually |
| **Desktop Exercise** | Normally involves interactive desktop discussions of a simulated scenario. OSM Desktop exercises may involve the following focus areas:<br>• Test the time required to finalise monitoring design;<br>• Test arrangements for delivery and use of data by IMT in decision-making; or<br>• Data exchange test with field (opportunistic when contractors in in the field) | Prior to undertaking a new offshore activity; or<br>At least annually |
| **Major Incident Management Exercise** | Involves IMT activation to establish command, control, and coordination of a Level 2 or 3 incident. Can simulate several different aspects of an oil spill incident and may involve third parties. OSM activation may be included as component of this exercise. | Prior to undertaking a new offshore activity; or<br>At least annually |

The purpose of these exercises is to test the preparedness of OSM Service Providers to respond in a timely manner to a potential Level 2 / Level 3 emergency oil pollution event and confirm adequacy of response arrangements.

BHP routinely undertakes post-exercise debriefings following Level 2 / Level 3 exercises and drills to identify opportunities for improvement and communicate lessons learned. Actions that are derived from drills and exercises including debriefs are documented in an action tracking system (1SAP) and tracked to closure.

BHP annually tests its standby arrangements and activation process with its OSM Service Providers, to ensure IMT roles and key OSM Service Provider personnel are familiar with the activation process and to check the OSM Service Provider's Standby Capability and Competency Report.

BHP incorporates OSM activation and planning into at least one desktop or incident management exercise each year.

# 10 Capability Assessment

**Table 10-1: OSM Capability**

| Component | Total Personnel Required (Weeks 1–2) [1] | Personnel Available via OSM Service Provider Standby Contract | Personnel Available via OSROs | BHP | Total Personnel Available |
|---|---|---|---|---|---|
| **OSM Personnel embedded in IMT** | 1 OSM Implementation Lead<br>1 OM Monitoring Coordinator<br>1 SM Coordinator<br>1 Field Operations Manager | 1 OSM Implementation Lead<br>1 OM Monitoring Coordinator<br>1 SM Coordinator<br>1 Field Operations Manager | N/A | 1 OSM Implementation Lead (initial) | 1 OSM Implementation Lead<br>1 OM Monitoring Coordinator<br>1 SM Coordinator<br>1 Field Operations Manager |
| **OMPs** | | | | | |
| **Hydrocarbon properties and weathering behaviour at sea*** | 4 team leaders<br>8 team members | 5 team leaders<br>10 team members | N/A | N/A | 5 team leaders<br>10 team members |
| **Shoreline clean-up assessment /**<br>**Marine reptiles (turtles) assessment (AOHSE-ER-0043)** | 5 team leaders<br>10 team members | 13 team leaders<br>24 team members | 13 team leaders (AMOSC)<br>12 team leaders (OSRL) | N/A | 26 team leaders<br>36 team members |

[1] If additional resources are required for week 3 onwards then this will be identified early in the monitoring process and BHP will activate additional contracted resources through its OSM Services Provider to increase capacity

| | | | | | |
|---|---|---|---|---|---|
| **Surface chemical dispersant effectiveness and fate** | Visual observations:<br>1 team leader<br>1 team member<br>Water quality assessment – refer to SMP: Water quality assessment | Refer to OMP: Hydrocarbon properties and weathering behaviour at sea | Visual observations:<br>3 team leaders<br>4 team members | N/A | Visual observations:<br>3 team leaders<br>4 team members |
| **Subsea chemical dispersant injection monitoring**<br>API Technical Report 1152: Industry Recommended Subsea Dispersant Monitoring Plan 2020 | 18 specialist personnel for 24 hour operation | N/A | 18 specialist personnel available through CSA Ocean Sciences via OSRL | N/A | 18 specialist personnel available through CSA Ocean Sciences via OSRL |
| **Water quality assessment*** (AOHSE-ER-0037) | Refer to *Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna* (AOHSE-ER-0037) | | | | |
| **Sediment quality assessment*** (AOHSE-ER-0037) | Refer to *Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna* (AOHSE-ER-0037) | | | | |
| **Marine mammals and megafauna assessment** (AOHSE-ER-0039) | 1 aerial team (including 1 Marine Mammal Observer (MMO) and 1 Aerial survey observer)<br>3 vessel teams (including 2 vessel-based survey trained | 16 MMOs<br>11 Aerial survey observers<br>21 vessel survey observers<br>6 experienced ornithologists<br>2 personnel with pathology or veterinary skills | N/A | N/A | 16 MMOs<br>11 Aerial survey observers<br>21 vessel survey observers<br>6 experienced ornithologists<br>2 personnel with pathology or veterinary skills |

| | | | | | |
|---|---|---|---|---|---|
| | MMOs, 1 experienced vessel survey observer per team) | | | | |
| **Air quality monitoring (responder health and safety)**<br>BHP Petroleum First Responder Air Monitoring Work Plan (11203437) | 2 Air Quality Specialist | | | 2 Air Quality Specialist<br>Specialists from Project and Technology Team | 2 Air Quality Specialist<br>Specialists from Project and Technology Team |
| **SMPs** | | | | | |
| **Water quality impact assessment** (AOHSE-ER-0037) | Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered<br>Refer to *Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna* (AOHSE-ER-0037) | | | | |
| **Sediment quality impact assessment** (AOHSE-ER-0037) | Refer to *Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna* (AOHSE-ER-0037) | | | | |
| **Intertidal and coastal habitat assessment** (AOHSE-ER-0037) | 4 team leaders<br>4 team members | 12 team leaders<br>21 team members | N/A | N/A | 12 team leaders<br>21 team members |
| **Seabirds and shorebirds** (AOHSE-ER-0038) | Note: can initially be performed by the same team as OMP: Marine fauna assessment – seabirds and shorebirds. This SMP may replace OMP: Marine fauna assessment – seabirds and shorebirds if the OMPs termination criteria are triggered | | | | |
| **Marine reptiles (turtles) assessment** (AOHSE-ER-0043) | Note: can initially be performed by SCAT team then replaced by OSM Service Provder. | | | | |
| **Marine mammals and megafauna assessment** (AOHSE-ER-0039) | Note: can initially be performed by the same team as OMP: Marine fauna assessment. This SMP may replace OMP: Marine fauna assessment if the OMPs termination criteria are triggered | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Benthic habitats and benthic primary producers assessment** (AOHSE-ER-0040) | 6 team leaders<br>12 team members | 6 team leaders<br>12 team members | N/A | N/A | 6 team leaders<br>12 team members |
| **Marine fish and elasmobranch assemblages assessment** (AOHSE-ER-0051) | 3 team leaders<br>6 team members | 2 senior marine scientists trained in fish identification and necropsy<br>9 scientists with fish survey and ROV/BRUV experience<br>7 team members | N/A | N/A | 2 senior marine scientists trained in fish identification and necropsy<br>9 scientists with fish survey and ROV/BRUV experience<br>7 team members |
| **Commercial and recreational fish species impact assessment** (AOHSE-ER-0048) | 3 team leaders<br>6 team members | 2 senior marine scientists trained in fish identification and necropsy<br>9 scientists with fish survey and ROV/BRUV experience<br>7 team members | N/A | N/A | 2 senior marine scientists trained in fish identification and necropsy<br>9 scientists with fish survey and ROV/BRUV experience<br>7 team members |
| **Heritage features assessment**<br>BHP Aboriginal Heritage Procedures (reference BHP MEMO HER A1000) activated by BHP Heritage Team. | 1 team leader<br>2 team members (including either ROV operator or marine diver/s) | 1 team leader<br>2 team members | N/A | 3–4 Cultural heritage specialists | 1 team leaders<br>2 team members (including either ROV operator or marine diver/s) |

# 11 Review of Plan

As part of the BHP internal document review system, this document will be reviewed annually and revised if necessary. This could include changes required in response to one or more of the following:

- When major changes have occurred, which affect either Operational Monitoring or Scientific Monitoring in either coordination, implementation, or capabilities. This includes a change of Service Providers or systems being used by the titleholders.
- Changes to the activity that affect Operational and/or Scientific Monitoring coordination or capabilities such as an increase of risk regarding the oil spill being responded to.
- Changes to legislation that impact or are related to Operational and/or Scientific Monitoring (e.g. EPBC, Environment Regulations, and others necessary to the project and implementation of OMP and SMPs).
- Following routine testing of the OSM if improvements or corrections are identified, or
- After a Level 2 or Level 3 spill incident.

The extent of changes made to this OSMP and requirements for regulatory submission will be informed by the relevant Commonwealth regulations, i.e. the Environment Regulations.

# Part B – Implementation

## 12 Activation Process

BHP's IMT Environment Unit Leader is responsible for activating OSMP components, subject to approval from the IMT leader. Table 12-1 outlines the OSM activation process.

**Table 12-1: OSM Activation Process**

| Responsibility | Task | Timeframe | Complete |
|---|---|---|---|
| **Environment Unit Leader (BHP)** | Review initiation criteria of OMPs and SMPs during the preparation of the initial Incident Action Plan (IAPs) and subsequent IAPs; and if any criteria are met, activate relevant OMPs and SMPs | Within 4 hours of spill notification | |
| | Obtain approval from Incident Commander Leader to initiate OSM | Within 4 hours of spill notification | |
| | Contact OSM Service Provider and notify on-call officer of incident, requesting provision of OSM Implementation Lead to the IMT | Within 4 hours of spill notification | |
| | Provide monitor and evaluate data (e.g. aerial surveillance, fate and weathering modelling, tracking buoy data) to OSM Service Provider | Within 1 hour of data being received by IMT | |
| | Liaise directly with OSM Service Provider to confirm which OMPs and SMPs are to be fully activated | Within 3 hours of monitor and evaluate data being received from IMT | |
| | Provide purchase order to OSM Service Provider (cross reference OSM Standby Services Scope of Work) | Within 72 hours of initial notification to OSM Service Provider | |
| | Record tasks in Personal Log | At time of completion of task | |
| **OSM Service Provider** | On-call officer to notify OSM Service Provider Manager of activation and contact OSM Implementation Lead and Scientific Logistics Coordinator | Within 8 hours of notification being made to OSM Service Provider | |
| | Send OSM Implementation Lead and Scientific Logistics Coordinator to IMT | Within 12 hours of notification being made to OSM Service Provider | |
| | Liaise directly with EUL to confirm which OMPs and SMPs are to be fully activated | Within 4 hours of monitor and evaluate data being received from IMT | |
| | Confirm availability of initial personnel and equipment resources | Within 5 hours of monitor and evaluate data being received from IMT | |

# 13 Monitoring Priorities

As described in Section 2, the available spill trajectory modelling has been analysed to understand the likely initial monitoring priorities for its activities in the EMBA. In addition, Table 4-2 lists comparability of available baseline data for receptors, to assist in identifying where post-spill, pre-impact monitoring should be prioritised.

The monitoring priorities provided in Section 2 and Table 4-2 are to be used for guidance when confirming monitoring priorities in consultation with key stakeholders and OSM Service Providers (including subject matter experts, where available) at the time of the spill. Table 13-1 provides a checklist to assist in the confirmation of monitoring priorities for individual spills.

**Table 13-1: Checklist for Determining Monitoring Priorities**

| Responsibility | Task | Timeframe | Complete |
|---|---|---|---|
| **OSM Service Provider with input from Environmental Unit Leader** | Confirm monitoring locations for activated OMPs and SMPs based on:<br>• Current monitor and evaluate data (i.e. situational awareness data, including predicted time to receptor impact, aerial/vessel surveillance observations, tracking buoy data, satellite data);<br>• Nature of hydrocarbon spill (i.e. subsea blowout, surface release, hydrocarbon characteristics, volume, expected duration of release);<br>• Seasonality and presence of receptors impacted or at risk of being impacted;<br>• Current information on transient and broadscale receptors (surface and subsea);<br>• Current operational considerations (e.g. weather, logistics);<br>• Monitoring priorities identified previously;<br>• Existing literature, baseline data, and monitoring programs. | Within 12 hours of monitor and evaluate data being received from IMT | |
| | Evaluate monitoring priorities in consultation with key stakeholders, including the appointed State/Territory Environment and Science Coordinator | Within 12 hours of monitor and evaluate data being received from IMT | |
| | Using the results of the baseline data analysis, determine the priority locations for post-spill and pre-impact monitoring | Within 12 hours of monitor and evaluate data being received from IMT | |
| | Confirm the need for any additional reactive baseline monitoring data for SMPs and determine suitable locations, noting that suitable control or reference sites may be outside of the EMBA | Within 12 hours of monitor and evaluate data being received from IMT | |
| | Continually re-evaluate monitoring priorities in consultation with EUL and relevant key stakeholders throughout spill response | Ongoing | |

# 14 Protected Matters Requirement

Table 14-1 provides a checklist to ensure monitoring personnel consider protected matters requirements in the finalisation of OMPs and SMPs.

Appendix B: Protected Matters Requirements outlines the management plans, recovery plans and conservation advice statements relevant for the protected matters within the EMBA that are likely to be relevant to the final design of the OMPs and SMPs. Appendix B: Protected Matters Requirements also includes relevant priority monitoring locations where these receptors are known to occur in order to expedite consideration of relevant information into finalised monitoring designs.

**Table 14-1: Checklist for Inclusion of Protected Matters into Monitoring Design**

| Responsibility | Task | Complete |
|---|---|---|
| **OSM Service Provider with input from Environment Unit Leader** | Review Monitoring, Evaluation and Surveillance data and available OMP data to determine likely presence and encounter of protected species in predicted trajectory of the spill | |
| | Review the relevant recovery plan/conservation advice/management plan in Appendix B: Protected Matters Requirements and determine if there have been any updates to the relevant conservation threats/actions. Integrate relevant considerations into the final monitoring design for affected OMPs and SMPs | |
| | Review restrictions on marine mammal, marine turtles and whale shark buffer distances in SMPs and ensure this is included in all relevant response and monitoring IAPs (e.g. Shoreline Protection Plan, Shoreline Clean-up Plan, OSM Plan), so that response and monitoring field teams maintain required buffer distances from fauna during operations | |

# 15 Finalising Monitoring Design

The methods presented in the Joint Industry OSMP framework designed by APPEA (2021) are designed to allow OSM Service Providers with the flexibility to modify the standard operating procedures. This is so the latest research, technologies, equipment, sampling methods, and variables may be used. Monitoring designs may also be varied in-situ, according to the factors presented in the APPEA Joint Industry OSM Framework Section 10.6.

Table 15-1 shows a checklist for the finalisation of the monitoring design that will be approached by the OSM Service Provider. The OSM Implementation Lead will be responsible for approving the finalised monitoring design used in the OMPs and SMPs.

**Table 15-1: Checklist for Finalising Monitoring Design**

| Responsibility | Task | Timeframe | Complete |
|---|---|---|---|
| **OSM Service Providers** | Confirm survey objectives, sampling technique, for each initiated OMP and SMP | Within 48 hours of initial monitoring priorities being confirmed by IMT | |
| | Determine suitable sampling frequency | Within 48 hours of initial monitoring priorities being confirmed by IMT | |
| | Finalise standard operating procedures | Within 48 hours of initial monitoring priorities being confirmed by IMT | |
| | Scientific monitoring:<br>• Establish benchmarks and guidelines to be used<br>• Confirm indicator species<br>• Confirm parameters and metrics | Within 96 hours of initial monitoring priorities being confirmed by IMT | |

# 16 Mobilisation

When the monitoring design has been finalised for each OMP and SMP, the OSM Service Provider shall work in conjunction with the Titleholder to develop and execute a monitoring mobilisation plan, which will be incorporated into the Incident Action Planning process.

OSM Service Provider will be required to coordinate the availability of personnel and equipment for all monitoring programs. BHP will be responsible for flights, accommodation and victualing for field personnel. BHP will also be required to procure all vessels, aerial platforms and vehicles for OMP and SMP implementation. A checklist for mobilising monitoring teams is provided in Table 16-1.

**Table 16-1: Checklist for Mobilisation of Monitoring Teams**

| Responsibility | Task | Complete |
|---|---|---|
| **OSM Service Provider with input from Environment Unit Leader** | Confirm availability of all monitoring personnel | |
| | Allocate number of teams, personnel, equipment, and supporting resource requirements | |
| | Undertake HAZIDs as required and consolidate/review the field documentation including safety plans, emergency response plans, and daily field reports | |
| | Develop site-specific health and safety plans / JHAs which is compliant with health safety and environment systems (including call in timing and procedures) | |
| | Conduct pre-mobilisation meeting with monitoring team/s on survey objectives, logistics, safety issues, reporting requirements, and data management collection requirements | |
| | Determine data management delivery needs of the IMT and process requirements, including data transfer approach and frequency/timing | |
| | Confirm data formats and metadata requirements with personnel receiving data | |
| | **Logistics** | |
| | Confirm flights, accommodation, and car hire arrangements are in place | |
| | Develop field survey schedules, detailing staff rotation | |
| | **Equipment** | |
| | Arrange survey platform (vessel, vehicle, aircraft) as required to survey or access survey sites and ensure they are equipped with appropriate fridge and freezer space for transportation of samples (and carcasses if collecting) | |
| | Ensure vessels have correct fit-out specifications (e.g. winches, GPS, satellite, hiab, sufficient deck space, water supplies, (fresh and/or salt), accommodation) and are shallow-hulled for nearshore waters. | |
| | Confirm consumables (including personal protective equipment) have been purchased and will be delivered to the required location | |
| | Liaise with NATA-accredited laboratories to confirm availability, sampling holding times, transportation, obtain sample analysis quotes, and arrange provision of appropriate sample containers, chain of custody (CoC) forms and suitable storage options for all samples. Make arrangements with couriers if necessary. | |
| | Confirm specialist equipment requirements and availability (including redundancy) | |
| | Check GPS units, Sat phones and digital cameras are working and that sufficient spare batteries and memory cards are available | |
| | Confirm sufficient equipment to allow integration of survey software and navigational systems (e.g. GPS, additional equipment and adaptors), and additional GPS units prepared | |
| | Confirm GPS survey positions (where available) have been QA/QC checked and pre-loaded into navigation software/positioning system | |
| | Check field laptops, ensuring they have batteries (including spares), power cable, and are functional | |
| | Check if a first aid kit or specialist PPE is required | |
| | Confirm arrangements for freight to mobilisation port is in place | |

# 17 Permits and Access Requirements

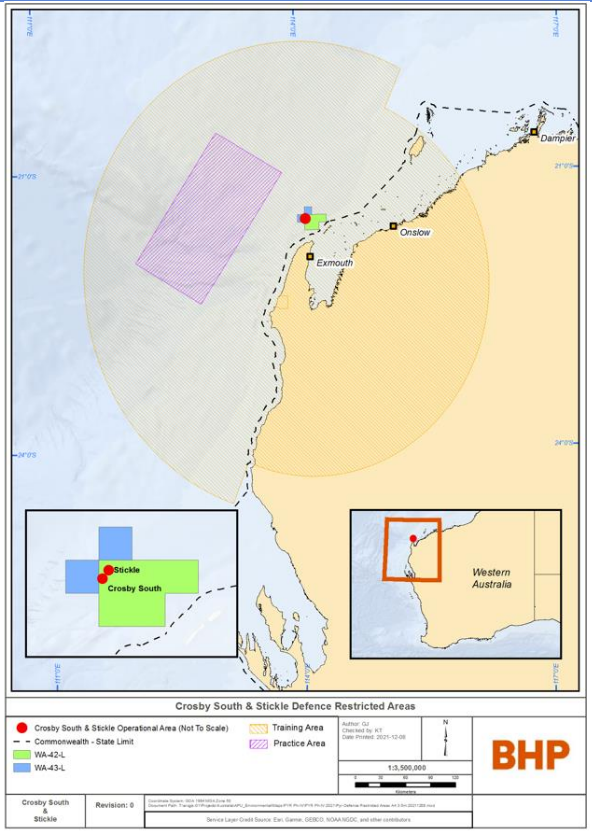
Permits and access requirements apply to Marine Parks, Marine Protected Areas, restricted heritage areas, operational areas of industrial sites, defence locations, certain fauna and managed fisheries. Table 17-1 lists the relevant protected areas, location, and jurisdictional authority.

The relevant IMT is responsible for submitting access and permit applications to all relevant jurisdictional authorities to conduct monitoring for OMPs and SMPs.

**Table 17-1: Permits and Access Requirements**

| Receptor | Location | Jurisdictional Authority | Relevant Information on Permits |
|---|---|---|---|
| State Marine Protected Areas; Fish Habitat Protection Areas | • Muiron Islands Marine Management Area<br>• Ningaloo Marine Park<br>• Shark Bay Marine Park<br>• Hamelin Pool Marine Nature Reserve<br>• Barrow Island Marine Park<br>• Montebello Islands Marine Park<br>• Eighty-Mile Beach | State government department with jurisdiction for parks and wildlife<br><br>State government department with jurisdiction for fisheries | No specific permitting requirements exist for monitoring in WA marine protected areas, but additional information is available at - https://www.dpaw.wa.gov.au/management/marine , https://www.dpaw.wa.gov.au/management/marine/marine-parks-and-reserves and https://www.fish.wa.gov.au/Sustainability-and-Environment/Aquatic-Biodiversity/Marine-Protected-Areas/Pages/default.aspx |
| Ramsar Wetlands | • Hosnies Spring<br>• The Dales<br>• Cape Range Subterranean Waterways<br>• Roebuck Bay<br>• Ashmore Reef<br>• Eighty-Mile Beach Marine Park | Commonwealth Department of Agriculture, Water and the Environment | Additional information on Ramsar wetlands and how they are protected as a matter of national environmental significance under the EPBC Act is available at https://www.environment.gov.au/epbc/what-is-protected/wetlands |
| Australian Commonwealth Marine Parks | • Argo-Rowley Terrace<br>• Ashmore Reef<br>• Carnarvon Canyon<br>• Cartier Island<br>• Dampier<br>• Eighty Mile Beach<br>• Gascoyne<br>• Kimberley<br>• Mermaid Reef<br>• Montebello<br>• Ningaloo<br>• Roebuck<br>• Shark Bay<br>• Abrolhos<br>• Bremer<br>• Jurien<br>• Perth Canyon<br>• South-West Corner<br>• Two Rocks | Parks Australia | Permit and licence application information for Marine Protected Areas (including monitoring) can be found at - https://onlineservices.environment.gov.au/parks/australian-marine-parks and https://onlineservices.environment.gov.au/parks/australian-marine-parks/permits<br><br>Additional information on permitting requirements in Australian Marine Parks can be obtained through Parks Australia via email marineparks@environment.gov.au or phone 1800 069 35 |

| Receptor | Location | Jurisdictional Authority | Relevant Information on Permits |
|---|---|---|---|
| State/Territory Managed Fisheries | • Mackerel Managed Fishery – Pilbara<br>• Pilbara Demersal Scalefish Fishery<br>• West Coast Deep Sea Crustacean Fishery<br>• Marine Aquarium Fish Managed<br>• Pilbara Developing Crab<br>• Sea Cucumber Managed<br>• SW Coast Salmon<br>• Specimen BHP Managed<br>• Abalone Managed<br>• Exmouth Gulf Prawn Managed<br>• Gascoyne Demersal Scalefish<br>• Onslow Prawn Managed<br>• Pearl Oyster Managed<br>• Pilbara Demersal Managed<br>• Shark Bay Crab Managed<br>• Shark Bay Scallop and Prawn<br>• West Coast Demersal Gillnet & Demersal Longline<br>• Western Rock Lobster | State/Territory government department with jurisdiction for fisheries | No specific permitting requirements exist for WA Fisheries, but additional information is available at – https://www.fish.wa.gov.au/Fishing-and-Aquaculture/Pages/default.aspx |
| Commonwealth Managed Fisheries | • North West Slope Trawl<br>• Small Pelagic<br>• Southern Bluefin Tuna<br>• Western Skipjack Tuna<br>• Western Tuna and Billfish Fishery<br>• Western Deepwater Trawl | Australian Fishing Management Authority | Commonwealth Managed Fisheries (scientific permit for research/monitoring in an Australian Fishing Zone)<br>https://www.afma.gov.au/fisheries-services/fishing-rights-permits |
| Indigenous Cultural Heritage | Sites are located throughout the EMBA | State/Territory government department with jurisdiction for indigenous heritage | Entry Access permits to Aboriginal Lands in WA – https://www.dplh.wa.gov.au/entrypermits<br><br>Aboriginal heritage sites in WA – https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-cultural-heritage/search-aboriginal-sites-or-heritage-places and |

| Receptor | Location | Jurisdictional Authority | Relevant Information on Permits |
|---|---|---|---|
| | | | https://www.dplh.wa.gov.au/information-and-services/aboriginal-heritage |
| Defence/Restricted Military Area | North Western Exercise Area and Military Restricted Airspace (R8541A) | Department of Defence |   Pink and Yellow shaded areas – defence activities near the Pyrenees Phase 4 Infill Drilling Program operational area |
| Industry (e.g. operational zone of offshore oil or gas platform) | • Julimar Development – Woodside<br>• Van Gogh Infill Installation – Santos<br>• Vincent Maersk Ngujima-Yin FPSO – Woodside | Operating Company | Safety zones (up to 500 m from the outer edge of well or equipment) – https://www.nopsema.gov.au/safety/safety-zones |
| Shipwrecks | • Batavia Shipwreck site | State/Territory or Commonwealth | Underwater heritage protected zones (Commonwealth) – www.environment.gov.au/heritage/underwater-heritage/protected-zones |

| Receptor | Location | Jurisdictional Authority | Relevant Information on Permits |
|---|---|---|---|
| | • HMAS Sydney II and HSK Kormoran Shipwreck Site<br>• Several (57) shipwrecks found within Australian Marine Parks listed in Table B-0-2 | government department with jurisdiction for maritime cultural heritage/archaeology | Commonwealth permit application – https://dmzapp17p.ris.environment.gov.au/shipwreck/public/forms/disturbanceAndZone.do?mode=add |

# 18 Use of Data in Response Decision Making

## 18.1 Operational Monitoring to Inform Response Activities

The OSM Service Provider is responsible for the collection of data by field teams, which shall be QA/QC checked by the Field Team Lead in accordance with the requirements listed in the finalised OMPs and SMPs (where applicable). The Team Lead will be responsible for communicating data back to the OSM Management Team via field reporting forms, debriefs and reports. Laboratory analysis reports should also be directed to the OSM Management Team.

The OSM Management Team is responsible for the interpretation and analysis of data. OMP data should be analysed rapidly so that it may be used to inform response planning and decisions in the current and/or next operating period. SMP data is designed to be more scientifically robust and long-term in nature and is not relied upon by the IMT for decision-making. Therefore, SMP data will be analysed more thoroughly by the OSM Management Team.

Once data is analysed and checked by the Field Team Lead, it will be provided to the IMT Situation Unit Lead, who will then distribute the data from each monitoring component to the relevant IMT Unit and/or Section.

Table 18-1 provides guidance on the type of data generated from each OMP, which IMT Section/Unit requires the data and how the data may be used during a response. All SMP data received during a response will be received by the IMT Situation Unit Lead and IMT Environment Unit Lead simultaneously.

Analysed data will then be incorporated into the Common Operating Picture (managed by the Situation Unit Lead) and used by the Environment Unit Lead during development of the operational SIMA, which would be included in the IAP for the current or next operating period.

As ultimately responsible for the IAPs, the Planning Section Chief will be required to determine if the response options can be commenced, continued, escalated, terminated, or if controls need to be put in place to manage impacts of the response activities. These decisions will be communicated to the broader IMT during regular situation debriefs.

**Table 18-1: Data generated from each OMP and how this may be used by IMT in decision-making**

| Operational Monitoring Plan | Data Generated[2] | IMT Section Requiring Data | How Data May Be Used by IMT |
|---|---|---|---|
| **Hydrocarbon properties and weathering behaviour at sea** (AOHSE-ER-0037) | Hydrocarbon physical characteristics (e.g. viscosity, asphaltene content, fingerprinting, weathering ratios of hydrocarbon chains) | Planning Section to aid in response option selection / modification | Changes to the hydrocarbon properties will affect the window of opportunity for particular responses and the associated logistical requirements of these responses, such as use of chemical dispersants, recovery and pumping equipment suitability, hydrocarbon storage and hydrocarbon disposal requirements |
| **Shoreline clean-up assessment** (AOHSE-ER-0057) | Assessment of shoreline character; assessment of shoreline oiling; recommendations for response activities; post-treatment surveys | Planning Section to aid in IAP development and response option selection / modification | Confirmation of shoreline character, habitats and fauna present which may influence selection of response tactics (e.g. no mechanical recovery if turtles are known to be nesting); Oil deposition and/or removal rate for a shoreline sector will help determine effectiveness of relevant tactics (e.g. shoreline protection and/or clean-up operations); Assessment teams provide ground-truthing of sites that are not possible via satellite imagery, therefore the IMT can rely on the recommendations of Assessment Teams (e.g. flagging access issues, suitable tactics, likely resourcing needs) |
| **Surface chemical dispersant effectiveness and fate** (AOHSE-ER-0055) | Visual observations of dispersant efficacy; concentration of hydrocarbons in water column (see also water quality assessment); | Environment Unit for use in operational SIMA; Planning Section to aid in IAP development; Operations Section to confirm dispersant effectiveness for decision-making purposes in current operations period. | Determine the effectiveness of dispersant in removing oil from sea surface and how dispersed oil is being distributed through the water column. This information can be used in SIMA to help decide if dispersants are being effective at treating high value receptors (SIMA to evaluate any trade-offs between receptors) |
| **Subsea dispersant injection** (API 1152) | Visual observations of dispersant efficacy; concentration of hydrocarbons in water column (see also water quality assessment) | Source Control Branch to aid decision-making for other source control operations; Environment Unit for use in operational SIMA; Planning Section to aid in IAP development. | Determine efficacy of subsea dispersant in treating oil to help understand if injection should continue or be modified; understand the nature and extent of the subsea plume; and provide an initial assessment of potential ecological effects. This information can be used in SIMA to help decide if dispersants are being effective at treating high value receptors (SIMA to evaluate any trade-offs between receptors) and also if subsea dispersants |

[2] Summary only. For additional detail, please refer to individual OMPs. Also note data outputs will be reliant on finalised monitoring design.

| | | | |
|---|---|---|---|
| | | | are effectively reducing volatile organic compound (VOC) levels so that operations are within lower explosive limits (LEL) |
| **Water quality assessment** (AOHSE-ER-0037) | Distribution of oil in water column and change in hydrocarbon concentrations (e.g. total recoverable hydrocarbons, BETEXN, PAH), physio-chemical parameters and dispersant detection | Situation Unit Lead to validate surveillance and modelling data; Planning Section for use in IAP | Confirm spatial extent of spill within the water column and verify spill modelling and surveillance data; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites. Data can also influence ongoing use of dispersant through ongoing operational SIMA. |
| **Sediment quality assessment** (AOHSE-ER-0037) | Distribution of oil in sediment and change in hydrocarbon concentrations (e.g. Total recoverable hydrocarbons, BETEXN, PAH) | Situation Unit Lead to validate surveillance and modelling data; Planning Section for use in IAP | Confirm spatial extent of spill; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites |
| **Marine fauna assessment** (AOHSE-ER-0039) | Rapid assessment of presence and distribution of marine fauna; evaluate impact of spill and response activities on fauna | Planning Section for use in IAP; Oiled Wildlife Unit/Division to help in developing Wildlife Response Sub-plan | Understanding of species, populations and geographical locations at greatest risk from spill impacts. IMT can use this information to help qualify locations with highest level of protection priority (e.g. dugong nursery area is at risk of high contact therefore dispersant use closest to spill source may be a preferred option); understanding the impacts of spill response activities can help IMT to modify or terminate activities if they are assessed as creating more harm than the oil alone (e.g. large shoreline clean-up teams and staging areas may disturb shorebird nesting resulting in adults abandoning chicks) |
| **Air quality monitoring (responder health and safety)**<br>BHP Petroleum First Responder Air Monitoring Work Plan (11203437) | Modelled outputs of airborne hydrocarbons, gases and chemicals and their predicted distribution | Operations Section to help determine safe zones in close vicinity of spill; Planning Section for use in IAP | Determine safe distances from spill source for response personnel; determine the presence and persistence of volatile organic compounds to know if response areas are safe for personnel, including source control. |

## 18.2 Impacts from Response Activities

Table 10-4 of the Joint Industry OSM Framework outlines the potential impacts from response activities and the relevant OMP/SMP for monitoring impacts. For example, if shoreline clean-up was being considered as a response option, then possible impacts resulting from that activity could include physical presence, ground disturbance, water/sediment quality decline and lighting/noise impacts to fauna.

When finalising monitoring designs, the OSM Implementation Lead shall review Table 10-4 of the Joint Industry OSM Framework to ensure potential impacts from response activities are considered and incorporated into relevant OMP/SMP designs.

## 18.3 Operational Monitoring of Effectiveness of Control Measures and Meeting Performance Standards

When finalising monitoring designs, the OSM Implementation Lead and Environment Unit Lead (or delegate) shall review the Environmental Performance Standards listed in the BHP OPEP and integrate checks into the monitoring design that will help determine if relevant Environmental Performance Standards are being met.

# 19 Data Management

The following reporting to BHP should be undertaken:

- Operational monitoring reports will be provided to the IMT as soon as possible to maintain situational awareness and advise response option requirements.
- Daily field survey reports detailing activities undertaken, HSE performance and survey progress.
- All sampling data and data interpretation provided in spatial data format and spreadsheets as appropriate.
- Technical survey reports detailing whether the termination criteria have been reached, including recommendations on the requirements of future monitoring. Where possible, reports will investigate if monitoring results indicate that the concentrations of hydrocarbons/chemicals are equal to or below reference/baseline data or benchmark levels. Reporting should include spatial assessment of the distribution of hydrocarbons/chemicals over time. Where possible, reporting should also include an assessment of performance of the response options against the environmental performance objectives in the relevant regulatory environmental permits other relevant environmental management documentation.

# 20 Quality Assurance and Quality Control

Robust quality assurance and quality control (QA/QC) measures are required to instill confidence in the operational and particularly the scientific monitoring plans. The requirements for QA/QC for BHP's monitoring plans include:

- Use of chain of custody forms, procedures for sampling, data collection templates and a data management plan;
- Quality control/review steps performed on the statistical analysis and interpretation (where applicable) – Peer review / expert panel review;
- Adhering to handling, storage, holding times and transport requirements in accordance with the finalised monitoring design;

- Collection and analyses of QA/QC samples in accordance with the finalised monitoring design;
- Archiving samples where applicable;
- Maintenance and calibrations of systems and equipment;
- Maintenance of metadata; and
- Data backup, storage, and archiving.

# 21 Communication Protocol

Communication protocols between BHP and its OSM Service Providers with respect to delivery of the OMPs and SMPs (during both preparedness and implementation) are intentionally defined to ensure clear and consistent information is provided in both directions. This clear and consistent messaging is critical in what would be a highly dynamic and evolving solution

In addition, BHP has obligations under various legislation to share monitoring outputs with regulatory agencies/authorities. This is described in Section 10.12 of the Joint Industry OSM Framework.

## 21.1 OSM Service Provider

Communication protocols between BHP and its OSM Service Providers with respect to delivery of the OMPs and SMPs (during both preparedness and implementation) are intentionally defined to ensure clear and consistent information is provided in both directions.

The following communication protocols must be observed:

- Communication between BHP and its OSM Service Providers during the preparedness phase (pre-spill) and during activation (prior to deployment) will be between the Environmental Unit Leader (EUL) and the OSM Service Provider Leads respectively.
- During implementation (post deployment), primary communication occurs via two pathways:
  - EUL and the OSM Service Provider Lead for contractual, management, scientific, and general direction matters; and
  - BHP On-Scene Commander and the OSM Service Provider's Field Operations Manager for on-site matters.
- All OSMP operational decisions should be logged in an OSMP decision log by key personnel.
- All OSMP tasks, actions, and requirements should be documented in an IAP during the response phase of the spill.
- The BHP EUL will keep the Operations Sections Chief, Logistics Section Chief, and Planning Section Chief briefed of the OSMP status as required.
- All correspondence (copies of emails and records of phone calls) between BHP and the OSM Service Providers during a response should be recorded and kept on file.
- All communication received by OSM Service Provider not in line with these protocols should be reported to the EUL who will seek guidance on the accuracy of the information received.
- Unless related to safety (e.g. evacuation), any direction or instruction received by the OSM Service Provider outside of these protocols should be confirmed via the BHP EUL or On-Scene Commander prior to implementation

During the post-response phase all communications shall be between the BHP EUL (or delegate) and the OSM Service Provider OSM Implementation Leads.

## 21.2 External Stakeholders

Results of OMPs and SMPs will be discussed with relevant stakeholders. Information will be shared with regulatory agencies and authorities as required and inputs received from stakeholders will be evaluated and where practicable, will be used to refine the ongoing spill response and/or ongoing operational and/or scientific monitoring.

BHP's IMT Public Information Officer and/or Liaison Officer (initially will be the same individual) will be the focal point for external engagement during the response operation.

Stakeholder communication post-response will be managed by BHP's External (Government) Relations Team.

# 22 Stand Down Process

Monitoring for each component will continue until termination criteria for individual components are reached. Typically, OMPs will terminate when agreement has been reached by the jurisdictional authority relevant to the spill and to terminate the response. SMPs will continue after the spill response has been terminated and until such a time as their termination criteria are also reached.

After OMPs are terminated, the OMP monitoring teams will be advised to stand down. Following this stage, the OSM Service Providers will run a lessons-learnt meeting between BHP, all monitoring providers, and other relevant stakeholders. It is the responsibility of BHP to ensure that lessons learnt are communicated to the relevant stakeholder groups. The lessons discussed should include both positive actions to be reinforced and lessons for actions that could be improved in the future, on standby, or response campaigns.

# 23 References

API (2020). API Technical Report 1152: Industry Recommended Subsea Dispersant Monitoring Plan.

APPEA (2021) Joint Industry Operational and Scientific Monitoring Plan Framework. Rev D.

APPEA (2021) Operational and Scientific Monitoring Bridging Implementation Plan Template. Rev A.

Kirby, M.F., Brant, J., Moore, J., Lincoln, S. (eds) (2018) PREMIAM – Pollution Response in Emergencies – Marine Impact Assessment and Monitoring: Post-incident monitoring guidelines. Second Edition. Science Series Technical Report. Cefas, Lowestoft.

NOPSEMA (2020) Information Paper: Operational and Scientific Monitoring Programs. (N-04750-IP1349 A343826).

NOPSEMA (2021) Guidance Note: Oil Pollution Risk Management. (N-04750-GN1488 A382148).

NOPSEMA (2021) Regulatoery Advice Statement on APPEA's Joint Industry Operational and Scientific Monitoring Framework.

# Appendix A: Baseline Data Sources

**Table A-0-1: Baseline Data Sources**

| Receptor | Existing Baseline Monitoring | Source / Data Custodian | Spatial Extent |
|---|---|---|---|
| **Water and sediment quality** | Background on Carnarvon Basin and information regarding the Northwest Shelf | CSIRO (Link to report) | Carnarvon Basin |
| | McAlpine, K.W., Sim, C.B., Masini, R.J. and Daly, T. (2010). Baseline petroleum hydrocarbon content of marine water, shoreline sediment and intertidal biota at selected sites in the Kimberley bioregion, Western Australia. Marine Technical Report Series No. MTR3, Office of the Environmental Protection Authority (OEPA), Perth, Western Australia | WA EPA (Link to report) | Kimberley bioregion (16 shoreline sites, mainland and islands, spanning 340 km) |
| | Hydrocarbon potential of the Middle to Upper Devonian sequences in the southern Carnarvon Basin, Western Australia | Regional Geology (Link to report) | Carnarvon Basin |
| | Montara Reports 'Control site water quality data' (Operational Monitoring Study O2 – Monitoring of Oil Character, Fate and Effects, Report 02 Water Quality and Monitoring of Oil Character, Fate and Effects, Report 03 Dispersant Treated Oil Distribution) | PTTEP (Link to report) | Broome to Darwin (Mainland) Islands – Browse, Ashmore, Cartier, Hibernia Reef |
| **Shorelines and intertidal habitats** | Browse Island habitat descriptions – Draft EIS Technical Appendices – Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment | INPEX (Link to report) | Browse Island |
| | Management Plan for the Ningaloo Marine Park | DPAW (Link to report) | Ningaloo Marine Park |
| | Ningaloo shorelines and intertidal habitats | DBCA (Link to report) | Muiron Islands and Ningaloo |
| **Benthic communities and fish assemblages** | Reef Research on the Ningaloo Coast | DBCA (Link to report) | Muiron Islands and Ningaloo |
| | Ningaloo Reef World Heritage Site | CSIRO (Link to report) | Ningaloo Region |
| | Ningaloo benthic communities composition | UWA (Link to report) | Ningaloo Region |
| | Ningaloo Marine Park monitoring program for benthic communities and fish assemblages | DBCA (Link to report) | Ningaloo Region |

| | | | |
|---|---|---|---|
| | Report and recommendations for Barrow Island | EPA (Link to report) | Barrow Island |
| | Applied Research Program (ARP7): Subtidal Benthos: towards benthic baselines in the Browse Basin. Final report – Submerged Shoals | BHP/INPEX (Link to report) | Echuca and Heywood shoals |
| | Marine Biodiversity Survey of Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reef | Western Australian Museum (Link to report) | Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reef |
| | Comparisons of benthic filter feeder communities on Barrow Island | WAMSI (Link to report) | Barrow Island |
| | Benthic primary productivity: production and herbivory of seagrasses, macroalgae and microalgae | WAMSI (Link to report) | Bardi Jawi Indigenous Protected Area (IPA), encompassing Cygnet Bay, One Arm Point, Jalan (Tallon Island) and Iwany (Sunday Island) |
| | Egg size and fecundity of biannually spawning corals at Scott Reef | AIMS – Foster, T and Gilmour, J (Link to report) | Scott Reef |
| **Marine reptiles** | Guide to Marine Reptiles and Amphibians on Barrow Island | Chevron (Link to report) | Barrow Island |
| | Marine turtles in the Kimberley: key biological indices required to understand and manage nesting turtles along the Kimberley coast | WAMSI (Link to report) | Near complete coverage of Kimberley Coast and Islands (>44,000 georeferenced images) |
| | Ecology of marine turtles of the Dampier Peninsula and the Lacepede Island Group, 2009–2010 | RPS/Woodside (Link to report) | Dampier Peninsula and the Lacepede Islands |
| | Ningaloo coast and turtle populations | DPAW (Link to report) | Ningaloo Region |
| **Seabirds and shorebirds** | The status of seabirds and shorebirds at Ashmore Reef, Cartier Island and Browse Island. Monitoring Program for the Montara Well Release. Pre-Impact Assessment and First Post-Impact Field Survey | PTTEP (Clarke *et al*) (Link to report) | Ashmore Reef (including Cartier Island) and Browse Island |
| | Evaluating the impacts of local and international pressures on migratory shorebirds in Roebuck Bay and Eighty Mile Beach | WAMSI (Rogers *et al*) (Link to report) | Roebuck Bay and Eighty Mile Beach |
| | Adele Island Bird Survey Report | DBCA (Boyle *et al*) (Link to report) | Adele Island |

| | | | |
|---|---|---|---|
| | BHP/INPEX ARP6 Milestone Report #7- Lacepede Islands: Report comparing the diet composition, foraging habitat and breeding between species and between years on Lacepede islands | Monash/UWA/AIMS | Lacepede Islands |
| | Ecological studies of the Bonaparte Archipelago and Browse Basin – Seabird Survey | INPEX (Link to report) | Browse Island and Maret Islands |
| **Marine mammals** | Whale Survey Report. Exmouth Marine Mammal Fauna Survey | EPA (Link to report) | Exmouth Gulf |
| | Humpback whale use of the Kimberley: understanding and monitoring spatial distribution (analysis of historical data, including other reports mentioned in this review. Also provides analysis of whale survey techniques and recommendations for future monitoring) | WAMSI | Kimberley Region |
| | Marine mammals between Ningaloo Marine Park and the Northern Territory border are of great significance | DPAW (Link to report) | Ningaloo Region |
| | Integrating Indigenous knowledge and survey techniques to develop a baseline for dugong (*Dugong dugon*) management in the Kimberley | WAMSI (Link to report) | North Kimberley (Broome to NT border)<br>South Kimberley (Broome to Port Hedland) |
| **Commercial fisheries** | Commercial fisheries data collected by WA Department of Fisheries (WA DoF) and Australian Fisheries Management Authority (AFMA) | WA DoF (Link to data)<br>AFMA (Link to data) | Australia wide |
| | Prawn Commercial Fisheries | Fish WA (Link to report) | Exmouth Gulf, Shark Bay |
| | Northwest Slope Trawl | DAWE (Link to report) | Northwest – Exmouth to NT |
| | Southern Bluefin Tuna | AFMA (Link to report) | Northwest WA |
| | Shark Bay scallops | GDC (Link to report) | Shark Bay |

# Appendix B: Protected Matters Requirements

**Table B-0-1: Summary of Relevant Species Recovery Plans, Approved Conservation Plans, and Threat Abatement Plans ***

| Species or Group | Relevant Plan/Conservation Advice | Threats and or Management Strategies Relevant to the Activity | Relevant OMPs and SMPs |
|---|---|---|---|
| **All Vertebrate Fauna** | | | |
| All vertebrate fauna | Threat Abatement Plan for the impacts of marine debris on vertebrate wildlife of Australia's coasts and oceans (DoEE, 2018) | Ship-sourced marine debris as a risk to vertebrate marine life through entanglement or ingestion | SMP: Marine Mammals and Megafauna |
| **Marine Mammals** | | | |
| Sei Whale | Conservation Advice for the Sei Whale (Threatened Species Scientific Committee, 2015a) | Noise interference | OMP: Operational water sampling and dispersant monitoring<br>OMP: Vessel Surveillance<br>OMP: OSTM/OSTB<br><br>SMP: Marine Mammals and Megafauna |
| | | Habitat degradation including pollution | |
| | | Vessel strike | |
| Blue Whale | Conservation Management Plan for the Blue Whale (DoE, 2015a) | Noise interference | |
| | | Habitat modification | |
| | | Vessel disturbance | |
| Fin Whale | Approved Conservation Advice for the Fin Whale (Threatened Species Scientific Committee, 2015b) | Noise interference | |
| | | Habitat degradation including pollution | |
| | | Vessel strike | |
| Southern Right Whale | Conservation Management Plan for the Southern Right Whale 2011-2021 (DSEWPaC, 2012a) | Noise interference | |
| | | Habitat modification | |
| | | Marine debris | |
| | | Vessel disturbance/ strike | |
| Humpback Whale | Approved Conservation Advice for the Humpback Whale (TSSC, 2015c) | Noise interference | |
| | | Habitat degradation | |
| | | Marine debris | |
| | | Vessel strike | |

| Species or Group | Relevant Plan/Conservation Advice | Threats and or Management Strategies Relevant to the Activity | Relevant OMPs and SMPs |
|---|---|---|---|
| Australian Sea Lion | Recovery Plan for the Australian Sea Lion (DSEWPaC, 2013a) | Habitat degradation including pollution and oil spills | |
| **Marine Reptiles** | | | |
| EPBC Act listed marine turtles in the EMBA:<br>• Loggerhead Turtle<br>• Green Turtle<br>• Hawksbill Turtle<br>• Flatback Turtle<br>• Leatherback Turtle<br>• Olive Ridley Turtle | National Light Pollution Guidelines for Wildlife, including marine turtles, seabirds and migratory shorebirds (DoEE, 2020).<br><br>Recovery Plan for Marine Turtles (DoEE, 2017).<br><br>Approved Conservation Advice for Leatherback Turtle (DEWHA, 2008). | Light pollution<br>Noise interference<br>Marine debris<br>Vessel disturbance/ strike<br>Habitat loss/ modification<br>Chemical discharge/ deteriorating water quality | OMP: Operational water sampling and dispersant monitoring<br>OMP: Vessel surveillance<br>OMP: OSTM/OSTB<br>SMP: Marine reptiles (AOHSE-ER-0043)<br><br>SCAT |
| Short-Nosed Seasnake | Approved Conservation Advice for *Aipysurus apraefrontalis* (Short-nosed Sea Snake) (TSSC, 2011a) | Habitat degradation<br>Chemical discharge/ deteriorating water quality | |
| **Fish, Sharks and Rays** | | | |
| Dwarf Sawfish | Approved Conservation Advice for *Pristis clavata* (Dwarf Sawfish) (DEWHA, 2009)<br>Sawfish and River Sharks Multispecies Recovery Plan (DoE, 2015b) | Habitat degradation and modification | OMP: Operational water sampling and dispersant monitoring<br>OMP: Vessel surveillance<br>OMP: OSTM/OSTB<br><br>SMP: Commercial and Recreational Fish Species<br>SMP: Fishes |
| Green Sawfish | Approved Conservation Advice for the Green Sawfish (*Pristis zijsron*) (Threatened Species Scientific Committee, 2008)<br>Sawfish and River Sharks Multispecies Recovery Plan (DoE, 2015b) | Habitat degradation and modification | |
| Grey Nurse Shark | Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (DoE, 2014b) | Habitat modification | |
| Northern River Shark | Sawfish and River Sharks Multispecies Recovery Plan (DoE, 2015b) | Habitat degradation and modification | |
| Whale Shark | Approved Conservation Advice for the Whale Shark (*Rhincodon typus)* (TSSC, 2015d) | Marine debris<br>Habitat disruption<br>Boat strike | |
| White Shark | National Recovery Plan for the White Shark (*Carcharodon carcharias* (DSEWPaC, 2013b) | Habitat modification | |

| Species or Group | Relevant Plan/Conservation Advice | Threats and or Management Strategies Relevant to the Activity | Relevant OMPs and SMPs |
|---|---|---|---|
| **Seabirds and Migratory Shorebirds** | | | |
| Seabirds and migratory shorebirds | National Light Pollution Guidelines for Wildlife, including marine turtles, seabirds and migratory shorebirds (DoEE, 2020) | Light pollution | OMP: Aerial Surveillance<br>OMP: OSTM/OSTB<br>OMP: Water sampling and dispersant monitoring<br>SMP: Seabirds and Migratory Shorebirds<br><br>SCAT |
| | Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans | Marine debris | |
| Australasian Bittern | Approved Conservation Advice for *Botaurus poiciloptilus* (Australasian bittern) (TSSC, 2019) | Habitat loss disturbance and modifications | OMP: Aerial Surveillance<br><br>SMP: Seabirds and Migratory Shorebirds |
| Australian Lesser Noddy | Approved Conservation Advice for the Australian lesser noddy (*Anous tenuirostris melanops*) (TSSC, 2015f) | Pollution and oil spills | |
| Australian Painted Snipe | Approved Conservation Advice for Australian painted snipe (*Rostratula australis*) (DSEWPaC, 2013c) | None listed relevant to the Activity | |
| Bar-Tailed Godwit (baueri) | Approved Conservation Advice for the bar-tailed godwit (western Alaskan) (*Limosa lapponica baueri*) (TSSC, 2016d) | Habitat loss and degradation from pollution | |
| Curlew Sandpiper | Approved Conservation Advice for the curlew sandpiper (*Calidris ferruginea*) (TSSC, 2015g) | Habitat loss and degradation from pollution | |
| Eastern Curlew | Approved Conservation Advice for eastern curlew (*Numenius madagascariensis*) (TSSC, 2015i) | Habitat loss and degradation from pollution | |
| Great Knot | Approved Conservation Advice for the great knot (*Calidris tenuirostris*) (TSSC, 2016b) | Habitat loss and degradation from pollution | |

| Species or Group | Relevant Plan/Conservation Advice | Threats and or Management Strategies Relevant to the Activity | Relevant OMPs and SMPs |
|---|---|---|---|
| Greater Sand Plover | Approved Conservation Advice for the greater sand plover (*Charadruis leschenaultii*) (TSSC, 2016c) | Habitat loss and degradation from pollution | |
| Lesser Sand Plover | Approved Conservation Advice Charadrius mongolus (Lesser sand plover) (TSSC, 2016f) | Habitat loss and degradation from pollution | |
| Red Knot | Approved Conservation Advice for the red knot (*Calidris canutus*) (TSSC, 2016a) | Habitat loss and degradation<br>Pollution/ contamination impacts | |
| Northern Siberian Bar-Tailed Godwit | Approved Conservation Advice for the bar-tailed godwit (northern Siberian) (*Limosa lapponica menzbieri*) (TSSC, 2016e) | Habitat loss and degradation from pollution | |
| Relevant EPBC Act-listed seabirds:<br>• Amsterdam Albatross<br>• Black-Browed Albatross<br>• Campbell Albatross<br>• Indian Yellow-Nosed Albatross<br>• Northern Giant Petrel<br>• Northern Royal Albatross<br>• Soft-Plumaged Petrel<br>• Southern Giant Petrel<br>• Shy Albatross<br>• Sooty Albatross<br>• Southern Royal Albatross<br>• Tristan Albatross<br>• Wandering Albatross<br>• White-Capped Albatross | Background Paper, Population Status and Threats to Albatrosses and Giant Petrels Listed as Threatened under the EPBC Act 1999 (DSEWPaC, 2011b)<br><br>National recovery plan for threatened albatrosses and giant petrels 2011-2016 (DSEWPaC, 2011c) | Marine pollution<br><br>Marine debris | OMP: Aerial Surveillance<br><br>SMP: Seabirds and Migratory Shorebirds |
| Abbott's Booby | Approved Conservation Advice for Abbott's booby (*Papasula abbotti*) (TSSC, 2015k) | Marine pollution | |
| Australian Fairy Tern | Approved Conservation Advice for Australian fairy tern (*Sternula nereis nereis*) (TSSC, 2011) | Oil spills | |
| Blue Petrel | Approved Conservation Advice for the blue petrel (*Halobaena caerulea*) (TSSC, 2015h) | None listed relevant to the activity | |
| Christmas Island Frigatebird | Approved Conservation Advice *Fregata andrewsi* (Christmas Island Frigatebird (TSSC, 2020a); and | Habitat loss disturbance and modifications | |

| Species or Group | Relevant Plan/Conservation Advice | Threats and or Management Strategies Relevant to the Activity | Relevant OMPs and SMPs |
|---|---|---|---|
| | National recovery plan for the Christmas Island Frigatebird (*Fregata andrewsi*) (Hill and Dunn, 2004) | | |
| Christmas Island White-Tailed Tropicbird | Approved Conservation Advice for *Phaethon lepturus fulvus* white-tailed tropicbird (Christmas Island) (DoE, 2014a) | Oil spills | |
| Fairy Prion (southern) | Approved Conservation Advice for fairy prion (southern) (*Pachyptila turtur subantarctica*) (TSSC, 2015j) | None listed relevant to the Activity | |
| Grey-Headed Albatross | Approved Conservation Advice for *Thalassarche chrysostoma* (Grey-headed Albatross) (DEWHA, 2009) | Marine debris, Oil spills | |
| Shy Albatross | Approved Conservation Advice for *Thalassarche cauta* (Shy Albatross) (TSSC, 2020b) | Marine debris | |
| Soft-Plumaged Petrel | Approved Conservation Advice for the soft-plumaged petrel (*Pterodroma mollis*) (TSSC, 2015e) | None listed relevant to the Activity | |

* References quoted in this table can be found in the reference list of the *Pyrenees Phase 4 Infill Drilling Program Environment Plan (BHPB-04PY-N950-0021)*

The Commonwealth Marine Reserves Network was established in 2012 for the purpose of protecting the biological diversity and sustainable use of the marine environment. There are six management plans – one for each of the five marine park networks (the North, the North-west, the South-east, the South-west and the Temperate East) and one for the Coral Sea. The Pyrenees Phase 4 Infill Drilling Program operational area does not intersect any marine parks. A number of marine parks fall within the wider EMBA (Table B-0-2). Information on the values of the Australian Marine Parks is provided in Section 4 of the *Pyrenees Phase 4 Infill Drilling Program EP (BHPB-04PY-N950-0021)* and was extracted from the Parks Australia website (https://parksaustralia.gov.au/).

**Table B-0-2: Australian Marine Parks within the EMBA**

| Value / Sensitivity | | Approx. Closest Distance to Operational Area | EMBA | | | Relevant OMPs and SMPs |
|---|---|---|---|---|---|---|
| | | | Operational Area | Area Potentially Exposed to Moderate Hydrocarbon Threshold | Area Potentially Exposed to Low Hydrocarbon Threshold | |
| **North-West Marine Region** | | | | | | |
| Argo-Rowley Terrace | Multiple Use Zone (IUCN Category VI)<br>National Park Zone (IUCN Category II)<br>Special Purpose Zone (IUCN Category VI) | 485 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance<br><br>SCAT |
| Ashmore Reef | Recreational Use Zone (IUCN Category IV)<br>Sanctuary Zone (IUCN Category Ia) | 1,383 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Carnarvon Canyon | Habitat Protection Zone (IUCN Category IV) | 345 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance<br><br>SCAT |
| Cartier Island | Habitat Protection Zone (IUCN Category IV) | 1,400 km | x | x | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Dampier | Habitat Protection Zone (IUCN Category IV)<br>Multiple Use Zone (IUCN Category VI)<br>National Park Zone (IUCN Category II) | 313 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance<br><br>SCAT |
| Eighty Mile Beach | Multiple Use Zone (IUCN Category VI) | 536 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Gascoyne | Habitat Protection Zone (IUCN Category IV)<br>Multiple Use Zone (IUCN Category VI) | 16 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |

| Value / Sensitivity | | Approx. Closest Distance to Operational Area | EMBA | | | Relevant OMPs and SMPs |
|---|---|---|---|---|---|---|
| | | | Operational Area | Area Potentially Exposed to Moderate Hydrocarbon Threshold | Area Potentially Exposed to Low Hydrocarbon Threshold | |
| | National Park Zone IUCN Category II) | | | | | SCAT |
| Kimberley | Multiple Use Zone (IUCN Category VI)<br>National Park Zone (IUCN Category II) | 880 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Mermaid Reef | National Park Zone (IUCN Category II) | 740 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Montebello | Multiple Use Zone (IUCN Category VI) | 143 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance<br><br>SCAT |
| Ningaloo | National Park Zone (IUCN Category II)<br>Recreational Use Zone (IUCN Category IV) | 13 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance<br><br>SCAT |
| Roebuck | Multiple Use Zone (IUCN Category VI) | 902 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Shark Bay | Multiple Use Zone (IUCN Category VI) | 322 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance<br><br>SCAT |
| **South-West Marine Region** | | | | | | |
| Abrolhos | Habitat Protection Zone (IUCN Category IV)<br>Multiple Use Zone (IUCN Category VI)<br>National Park Zone (IUCN Category II) | 490 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance<br><br>SCAT |
| | Special Purpose Zone (IUCN Category VI) | 650 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Bremer | National Park Zone (IUCN Category II) | 1,860 km | x | x | ✓ | |

| Value / Sensitivity | | Approx. Closest Distance to Operational Area | EMBA | | | Relevant OMPs and SMPs |
|---|---|---|---|---|---|---|
| | | | Operational Area | Area Potentially Exposed to Moderate Hydrocarbon Threshold | Area Potentially Exposed to Low Hydrocarbon Threshold | |
| | Special Purpose Zone (Mining Exclusion) (IUCN Category VI) | | | | | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Jurien | National Park Zone (IUCN Category II)<br>Special Purpose Zone (IUCN Category VI) | 960 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Perth Canyon | Habitat Protection Zone (IUCN Category IV)<br>Multiple Use Zone (IUCN Category VI)<br>National Park Zone (IUCN Category II) | 1,108 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| South-West Corner | Habitat Protection Zone (IUCN Category IV)<br>Multiple Use Zone (IUCN Category VI)<br>National Park Zone (IUCN Category II)<br>Special Purpose Zone (IUCN Category VI)<br>Special Purpose Zone (Mining Exclusion) (IUCN Category VI) | 1,312 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |
| Two Rocks | Multiple Use Zone (IUCN Category VI)<br>National Park Zone (IUCN Category II) | 1,092 km | x | ✓ | ✓ | OMP: Operational water sampling and Dispersant Monitoring<br>OMP: Vessel Surveillance<br>OMP: Aerial Surveillance |

There are no State Marine Parks or Marine Management Areas located within the Pyrenees Phase 4 Infill Drilling Program operational area. Twenty-two State Marine Parks and Marine Management Areas that fall within the wider EMBAs are listed in Table B-0-3, and described in Section 4 of the *Pyrenees Phase 4 Infill Drilling Program EP (BHPB-04PY-N950-0021)*.

**Table B-0-3: State Marine Parks and Marine Management Areas within the EMBA**

| Value / Sensitivity | | Approx. Closest Distance to Operational Area | EMBA | | |
|---|---|---|---|---|---|
| | | | Operational Area | Area Potentially Exposed to Moderate Hydrocarbon Threshold | Area Potentially Exposed to Low Hydrocarbon Threshold |
| Abrolhos Islands | Fish Habitat Protection Area (IUCN IV) | 733 km | x | ✓ | ✓ |
| Beagle Islands | Nature Reserve (IUCN Ia) | 913 km | x | ✓ | ✓ |
| Barrow Island | Marine Park (IUCN Ia) | 138 km | x | ✓ | ✓ |

| Value / Sensitivity | | Approx. Closest Distance to Operational Area | EMBA | | |
|---|---|---|---|---|---|
| | | | Operational Area | Area Potentially Exposed to Moderate Hydrocarbon Threshold | Area Potentially Exposed to Low Hydrocarbon Threshold |
| | Marine Management Area (IUCN VI) | | | | |
| Eighty Mile Beach | Marine Park (IUCN VI) | 580 km | x | ✓ | ✓ |
| Great Sandy Island | Nature Reserve (IUCN Ia) | 138 km | x | ✓ | ✓ |
| Jurien Bay | Marine Park (IUCN II) | 950 km | x | ✓ | ✓ |
| | Marine Park (IUCN Ia) | | | | |
| Kalbarri Blue Holes | Fish Habitat Protection Area (IUCN IV) | 677 km | x | ✓ | ✓ |
| Lancelin Island Lagoon | Fish Habitat Protection Area (IUCN IV) | 1,049 km | x | ✓ | ✓ |
| Marmion | Marine Park (IUCN IV) | 1,126 km | x | ✓ | ✓ |
| Miaboolya Beach | Fish Habitat Protection Area (IUCN IV) | 349 km | x | x | ✓ |
| Montebello Islands Marine Park | Marine Park (IUCN IV) | 177 km | x | ✓ | ✓ |
| | Marine Park (IUCN Ia) | | | | |
| | Marine Park (IUCN II) | | | | |
| Muiron Islands | Marine Management Area (IUCN VI) | 22 km | x | ✓ | ✓ |
| | Marine Management Area (IUCN Ia) | | | | |
| Ngari Capes | Marine Park (IUCN VI) | 1,322 km | x | ✓ | ✓ |
| Ningaloo | Marine Park (IUCN II) | 19 km | x | ✓ | ✓ |
| | Marine Park (IUCN Ia) | | | | |
| Nyangumarta Warram | Indigenous Protected Area (IUCN VI) | 642 km | x | ✓ | ✓ |
| Point Quobba | Fish Habitat Protection Area (IUCN IV) | 329 km | x | ✓ | ✓ |
| Rowley Shoals | Marine Park (IUCN II) | 652 km | x | ✓ | ✓ |
| | Marine Park (IUCN Ia) | | | | |
| Scott Reef | Nature Reserve (IUCN Ia) | 1,138 km | x | ✓ | ✓ |
| Shark Bay | Marine Park (IUCN II) | 378 km | x | ✓ | ✓ |
| | Marine Park (IUCN Ia) | | | | |
| Shoalwater Island | Marine Park (IUCN VI) | 1,193 km | x | ✓ | ✓ |
| | Marine Park (IUCN Ia) | | | | |
| Thevenard Island | Nature Reserve (IUCN Ia) | 87 km | x | ✓ | ✓ |
| Walpole and Nornalup Inlets | Marine Park (IUCN II) | 1,495 km | x | ✓ | ✓ |

Key Ecological Features (KEFs) with boundaries that intercept the Pyrenees Phase 4 Infill Drilling Program operational area and EMBA are listed in Table B-0-4. Information on the relevant KEFs has been extracted DSEWPaC (2012b; 2012c) and summarised in Section 4 of the *Pyrenees Phase 4 Infill Drilling Program EP (BHPB-04PY-N950-0021).*

**Table B-0-4: Key Ecological Features within the EMBA**

| Value / Sensitivity | Approx. Closest Distance to Operational Area | EMBA | | |
|---|---|---|---|---|
| | | Operational Area | Area Potentially Exposed to Moderate Hydrocarbon Threshold | Area Potentially Exposed to Low Hydrocarbon Threshold |
| **North-West Marine Region** | | | | |
| Ancient coastline at 125-m depth contour | 10 km | x | ✓ | ✓ |
| Ashmore Reef and Cartier Island and surrounding Commonwealth waters | 1,383 km | x | ✓ | ✓ |
| Canyons linking the Argo Abyssal Plain and Scott Plateau | 220 km | x | ✓ | ✓ |
| Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula | Overlaps with operational area | ✓ | ✓ | ✓ |
| Continental slope demersal fish communities | 3 km | x | ✓ | ✓ |
| Commonwealth waters adjacent to Ningaloo Reef | 13 km | x | ✓ | ✓ |
| Exmouth Plateau | 87 km | x | ✓ | ✓ |
| Glomar Shoals | 340 km | x | ✓ | ✓ |
| Mermaid Reef and Commonwealth waters surrounding Rowley Shoals | 632 km | x | ✓ | ✓ |
| Seringapatam Reef and Commonwealth waters in the Scott Reef complex | 1,132 km | x | ✓ | ✓ |
| Wallaby Saddle | 500 km | x | ✓ | ✓ |
| **South-West Marine Region** | | | | |
| Albany Canyons group and adjacent shelf break | 1,515 km | x | ✓ | ✓ |
| Ancient coastline at 90-120 m depth | 680 km | x | ✓ | ✓ |
| Cape Mentelle upwelling | 1,321 km | x | ✓ | ✓ |
| Commonwealth marine environment surrounding the Houtman Abrolhos Islands | 720 km | x | ✓ | ✓ |
| Commonwealth marine environment surrounding the Recherche Archipelago | 1,551 km | x | x | ✓ |
| Commonwealth marine environment within and adjacent to Geographe Bay | 1,302 km | x | ✓ | ✓ |
| Commonwealth marine environment within and adjacent to the west coast inshore lagoons | 725 km | x | ✓ | ✓ |
| Diamantina Fracture Zone | 1,582 km | x | x | ✓ |
| Naturaliste Plateau | 1,310 km | x | ✓ | ✓ |
| Perth Canyon and adjacent shelf break, and other west coast canyons | 710 km | x | ✓ | ✓ |
| Western demersal slope and associated fish communities | 480 km | x | ✓ | ✓ |
| Western rock lobster | 680 km | x | ✓ | ✓ |

**Table B-0-5: Summary of Listed National Heritage Sites**

| Name | EMBA Presence | | |
|---|---|---|---|
| | Operational Area | Area Potentially Exposed to Moderate Hydrocarbon Threshold | Area Potentially Exposed to Low Hydrocarbon Threshold |
| **Natural** | | | |
| Shark Bay, Western Australia | x | ✓ | ✓ |
| The Ningaloo Coast | x | ✓ | ✓ |
| The West Kimberley | x | ✓ | ✓ |
| **Indigenous** | | | |
| Dampier Archipelago (including Burrup Peninsula) | x | ✓ | ✓ |
| **Historic** | | | |
| Batavia Shipwreck Site and Survivor Camps Area 1629 – Houtman Abrolhos | x | ✓ | ✓ |
| Dirk Hartog Landing Site 1616 - Cape Inscription Area | x | ✓ | ✓ |
| HMAS Sydney II and HSK Kormoran Shipwreck Sites | x | ✓ | ✓ |

**Table B-0-6: Summary of Listed Commonwealth Heritage Sites**

| Name | Presence | | |
|---|---|---|---|
| | Operational area | Area potentially exposed to moderate hydrocarbon threshold | Area potentially exposed to low hydrocarbon threshold |
| **Natural** | | | |
| Ashmore Reef National Nature Reserve | x | x | ✓ |
| Christmas Island Natural Areas | x | ✓ | ✓ |
| Mermaid Reef - Rowley Shoals | x | ✓ | ✓ |
| Ningaloo Marine Area - Commonwealth Waters | x | ✓ | ✓ |
| Scott Reef and Surrounds - Commonwealth Area | x | ✓ | ✓ |
| **Historic** | | | |
| HMAS Sydney II and HSK Kormoran Shipwreck Sites | x | ✓ | ✓ |

**Table B-0-7: Summary of Listed Wetlands of International Importance**

| Name | Presence | | |
|---|---|---|---|
| | Operational area | Area potentially exposed to moderate hydrocarbon threshold | Area potentially exposed to low hydrocarbon threshold |
| Ashmore Reef National Nature Reserve | x | x | ✓ |
| Eighty-mile Beach | x | x | ✓ |
| Hosnies Spring | x | ✓ | ✓ |
| Roebuck Bay | x | x | ✓ |
| The Dales | x | ✓ | ✓ |

**Table B-0-8: Summary of Listed Nationally Important Wetlands**

| Name | Approx. closest distance to operational area | Presence | | |
|---|---|---|---|---|
| | | Operational area | Area potentially exposed to moderate hydrocarbon threshold | Area potentially exposed to low hydrocarbon threshold |
| Ashmore Reef | 1,394 km | x | ✓ | ✓ |
| Cape Leeuwin System | 1,402 km | x | ✓ | ✓ |
| Cape Range Subterranean Waterways | 17 km | x | ✓ | ✓ |
| De Grey River | 552 km | x | ✓ | ✓ |
| Eighty Mile Beach System | 582 km | x | ✓ | ✓ |
| Exmouth Gulf East | 68 km | x | ✓ | ✓ |
| Hutt Lagoon System | 716 km | x | ✓ | ✓ |
| Learmonth Air Weapons Range – Saline Coastal Flats | 99 km | x | ✓ | ✓ |
| Leslie (Port Hedland) Saltfields System | 494 km | x | ✓ | ✓ |
| Mermaid Reef | 749 km | x | ✓ | ✓ |
| Murchison River (Lower Reaches) | 669 km | x | ✓ | ✓ |
| Roebuck Bay | 912 km | x | ✓ | ✓ |
| Shark Bay East | 447 km | x | ✓ | ✓ |
| Willie Creek Wetlands | 941 km | x | ✓ | ✓ |

**Table B-0-9: Summary of Listed Threatened Ecological Communities**

| Name | EPBC Act Status | EMBA Presence | | |
|---|---|---|---|---|
| | | Operational area | Area potentially exposed to moderate hydrocarbon threshold | Area potentially exposed to low hydrocarbon threshold |
| Subtropical and Temperate Coastal Saltmarsh | Vulnerable | x | ✓ | ✓ |

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