# Scarborough Drilling and Completions Environment Plan

October 2023

Revision 6

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# 1 INTRODUCTION

## 1.1 Overview

The Scarborough gas resource, located in Commonwealth waters approximately 375 km west-northwest of the Burrup Peninsula, forms part of the Greater Scarborough gas fields, comprising the Scarborough, Thebe and Jupiter gas fields (**Figure 3-1**). Woodside Energy Scarborough Pty Ltd (Woodside), as Titleholder under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth) (referred to as the Environment Regulations), proposes to undertake the following petroleum activities within Permit Area WA-61-L:

- drilling and development of eight to ten production wells
- Inspection, Monitoring, Maintenance and Repair (IMMR) activities for installed infrastructure.

These activities will hereafter be referred to as the Petroleum Activities Program and form the scope of this Environment Plan (EP).

This EP has been prepared by Woodside as part of the requirements under the Environment Regulations, as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

The Petroleum Activities Program as defined in this EP is a part of the Scarborough Offshore Project Proposal (OPP) accepted by NOPSEMA on 30th March 2020.

## 1.2 Defining the Petroleum Activity

The Petroleum Activities Program to be undertaken within Permit Area WA-61-L comprises petroleum activities, drilling and completions, as defined in Regulation 4 of the Environment Regulations.

## 1.3 Purpose of the Environment Plan

In accordance with the objectives of the Environment Regulations, the purpose of this EP is to demonstrate that:

- the potential environmental impacts and risks (planned (routine and non-routine) and unplanned) that may result from the Petroleum Activities Program are identified;
- appropriate management controls are implemented to reduce impacts and risks to a level that is 'as low as reasonably practicable' (ALARP) and acceptable; and
- the Petroleum Activities Program is performed in a manner consistent with the principles of ecologically sustainable development (as defined in Section 3A of the *Environment Protection and Biodiversity Conservation Act, 1999* (Cth) (EPBC Act)).

This EP describes the process and resulting outputs of the risk assessment, whereby impacts and risks are managed accordingly.

The EP defines activity-specific Environmental Performance Outcomes (EPOs), environmental performance standards (EPSs) and measurement criteria (MCs). These form the basis for monitoring, auditing and management of the Petroleum Activities Program to be undertaken by Woodside and its contractors. The implementation strategy (derived from the decision support framework tools) specified within this EP provides Woodside and NOPSEMA with the required level of assurance that impacts, and risks associated with the activity are reduced to ALARP and are acceptable.

## 1.4 Scope of the Environment Plan

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in **Section 3**. The spatial boundary of the Petroleum Activities Program has been described and assessed using two 'areas', the Operational Area and the Permit Area. The combination of the Operational Area and Permit Area defines the spatial boundary of the Petroleum Activities Program, as described, risk-assessed and managed by this EP.

This EP addresses potential environmental impacts from planned activities within the Operational Area and any potential unplanned events that originate from the activity within the Operational Area.

Transit to and from the Operational Area by MODU, installation vessels and support vessels as well as port activities associated with these vessels, are not within the scope of this EP. Vessels supporting the petroleum activities operating outside the Operational Area (e.g. transiting to and from port) are subject to all applicable maritime regulations and other requirements and are not managed by this EP.

## 1.5 Environment Plan Summary

An EP summary will be prepared based on the material provided in this EP, addressing the items listed in **Table 1-1** as required by Regulation 11(4).

**Table 1-1: EP Summary**

| EP Summary material requirement | Relevant section of EP containing EP Summary material |
|---|---|
| The location of the activity | **Section 3.4** |
| A description of the receiving environment | **Section 4** |
| A description of the activity | **Section 3** |
| Details of the environmental impacts and risks | **Section 6** |
| The control measures for the activity | **Section 6** |
| The arrangements for ongoing monitoring of the titleholder's environmental performance | **Section 6** |
| Response arrangements in the oil pollution emergency plan | **Section 7.10** |
| Consultation already undertaken and plans for ongoing consultation | **Section 5** |
| Details of the titleholders nominated liaison person for the activity | **Section 1.8** |

## 1.6 Structure of the Environment Plan

This EP has been structured to reflect the process and requirements of the Environment Regulations as outlined in **Table 1-2**.

**Table 1-2: EP process phases, applicable regulations and relevant section of EP**

| Criteria for acceptance | Content requirements/relevant regulations | Elements | Section of EP |
|---|---|---|---|
| Regulation 10A(a):<br>*Is appropriate for the nature and scale of the activity* | Regulation 13:<br>*Environmental assessment*<br>Regulation 14:<br>*Implementation strategy for the environment plan*<br>Regulation 16:<br>*Other information in the environment plan* | The principle of 'nature and scale' is applicable throughout the EP. | **Section 2**<br>**Section 3**<br>**Section 4**<br>**Section 5**<br>**Section 6**<br>**Section 7** |
| Regulation 10A(b):<br>*Demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable*<br>Regulation 10A(c):<br>*Demonstrates that the environmental impacts and risks of the activity will be of an acceptable level* | Regulation 13(1)–13(7):<br>*13(1) Description of the activity*<br>*13(2)(3) Description of the environment*<br>*13(4) Requirements*<br>*13(5)(6) Evaluation of environmental impacts and risks*<br>*13(7) Environmental Performance Outcomes and standards*<br>*Regulation 16(a) to 16(c):*<br>*A statement of the titleholder's corporate environmental policy*<br>*A report on all consultations between the titleholder and any relevant person* | Set the context (activity and existing environment).<br>Define 'acceptable' (the requirements, the corporate policy, relevant persons).<br>Detail the impacts and risks.<br>Evaluate the nature and scale.<br>Detail the control measures – ALARP and acceptable. | **Section 1**<br>**Section 2**<br>**Section 3**<br>**Section 4**<br>**Section 5**<br>**Section 6**<br>**Section 7** |
| Regulation 10A(d):<br>*Provides for appropriate Environmental Performance Outcomes, environmental performance standards and measurement criteria* | Regulation 13(7):<br>*Environmental Performance Outcomes and standards* | Environmental Performance Outcomes (EPO).<br>Environmental performance standards (EPS).<br>Measurement criteria (MC). | **Section 6** |
| Regulation 10A(e):<br>*Includes an appropriate implementation strategy and monitoring, recording and reporting arrangements* | Regulation 14:<br>*Implementation strategy for the environment plan* | Implementation strategy, including:<br>• Environmental Management System (EMS)<br>• Performance monitoring<br>• Oil Pollution Emergency Plan (OPEP – per **Table 7-8**) and scientific monitoring<br>• Ongoing consultation | **Section 7**<br>**Appendix D** |
| Regulation 10A(f):<br>*Does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property within the meaning of the Environment Protection and Biodiversity* | Regulation 13(1)–13(3):<br>*13(1) Description of the activity*<br>*13(2) Description of the environment*<br>*13(3) Without limiting [Regulation 13(2)(b)], relevant values and sensitivities may include any of the following:*<br>*(a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act;* | No activity, or part of the activity, undertaken in any part of a declared World Heritage property. | **Section 3**<br>**Section 4**<br>**Section 6** |

| Criteria for acceptance | Content requirements/relevant regulations | Elements | Section of EP |
|---|---|---|---|
| *Conservation Act 1999 (EPBC Act)* | *(b) the national heritage values of a National Heritage place within the meaning of that Act;*<br>*(c) the ecological character of a declared Ramsar wetland within the meaning of that Act;*<br>*(d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act;*<br>*(e) the presence of a listed migratory species within the meaning of that Act;*<br>*(f) any values and sensitivities that exist in, or in relation to, part or all of:*<br>*(i) a Commonwealth marine area within the meaning of that Act; or*<br>*(ii) Commonwealth land within the meaning of that Act.* | | |
| Regulation 10A(g):<br>*(i) the titleholder has carried out the consultations required by Division 2.2A*<br>*(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate* | Regulation 11A:<br>*Consultation with relevant authorities, persons and organisations, etc.*<br>*Regulation 16(b):*<br>*A report on all consultations between the titleholder and any relevant person* | Consultation undertaken in the preparation of this EP. | **Section 5** |
| Regulation 10A(h):<br>*Complies with the Act and the regulations* | Regulation 13(4)a:<br>*Describe the requirements, including legislative requirements, that apply to activity and are relevant to the environmental management of the activity*<br>*Regulation 15:*<br>*Details of the Titleholder and liaison person*<br>*Regulation 16(a):*<br>*A statement of the titleholder's corporate environmental policy*<br>*Regulation 16(c):*<br>*Details of all reportable incidents in relation to the proposed activity* | All contents of the EP must comply with the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and the Environment Regulations | **Section 1.6**<br>**Section 1.7**<br>**Section 1.8**<br>**Section 6.8** |

## 1.7 Description of the Titleholder

Woodside is Operator of the various joint ventures relating to the Scarborough Project, which comprises the Scarborough, Thebe and Jupiter fields. The joint ventures comprise both Woodside Energy Scarborough Pty Ltd and Woodside Energy (Australia) Pty Ltd.

Woodside is the largest Australian natural gas producer. The company operates Australia's biggest resource development, the North West Shelf Project (NWS Project) in Western Australia.

The Woodside-operated producing LNG assets in the north-west of Australia are among the world's best facilities. The NWS Project has been operating for 35 years delivering one-third of Australia's

oil and gas production from one of the world's largest LNG facilities. Pluto LNG also forms part of Woodside's outstanding base business, and since commissioning in 2012, has delivered over 500 LNG cargoes.

Woodside recognises that strong environmental performance is essential to success and continued growth. Woodside has an established methodology to identify impacts and risks and assess potential consequences of activities. Strong partnerships, sound research and transparency are the key elements of Woodside's approach to the environment.

## 1.8 Details of Titleholder, Liaison Person and Public Affairs Contact

In accordance with Regulation 15 of the Environment Regulations, details of the titleholders, liaison person and arrangements for the notification of changes are described below.

### 1.8.1 Titleholders

*Woodside Energy Scarborough Pty Ltd:*
11 Mount Street, Perth, Western Australia
Telephone: 08 9348 4000
Fax Number: 08 9214 2777
ABN: 650 177 227

### 1.8.2 Nominated Liaison Person

Andrew Winter
Corporate Affairs Manager
11 Mount Street, Perth, Western Australia
Phone: 08 9348 4000
Fax Number: 08 9214 2777
feedback@woodside.com.au

### 1.8.3 Arrangements for Notifying of Change

Should the titleholder, titleholder's nominated liaison person or the contact details for either change, then NOPSEMA is to be notified of the change in writing within two weeks or as soon as practicable.

## 1.9 Woodside Management System

The Woodside Management System (WMS) provides a structured framework of documentation to set common expectations governing how all employees and contractors at Woodside will work. Many of the standards presented in **Section 6** are drawn from the WMS documentation, which comprises of four elements: Compass and Policies, Expectations, Processes and Procedures, and Guidelines, outlined below (and illustrated in **Figure 1-1**):

- **Compass and Policies:** Set the enterprise-wide direction for Woodside by governing our behaviours, actions and business decisions and ensuring we meet our legal and other external obligations.
- **Expectations:** Set essential activities or deliverables required to achieve the objectives of the Key Business Activities and provide the basis for development of processes and procedures.
- **Processes and Procedures:** Processes identify the set of interrelated or interacting activities which transforms inputs into outputs, to systematically achieve a purpose or specific objective. Procedures specify what steps, by whom and when are required to carry out an activity or a process.

- **Guidelines:** Provide recommended practice and advice on how to perform the steps defined in Procedures, together with supporting information and associated tools. Guidelines provide advice on: how activities or tasks may be performed; information that may be taken into consideration; or, how to use tools and systems.


**Figure 1-1:The four major elements of the WMS framework**

The WMS is organised within a business process hierarchy based upon key business activities to ensure the system remains independent of organisation structure, is globally applicable and scalable wherever required. These business activities are grouped into management, support and value stream activities as shown in **Figure 1-2.** The value stream activities capture, generate and deliver value−through the exploration and production (E and P) lifecycle. The management activities influence all areas of the business, while support activities may influence one or more value stream activities.

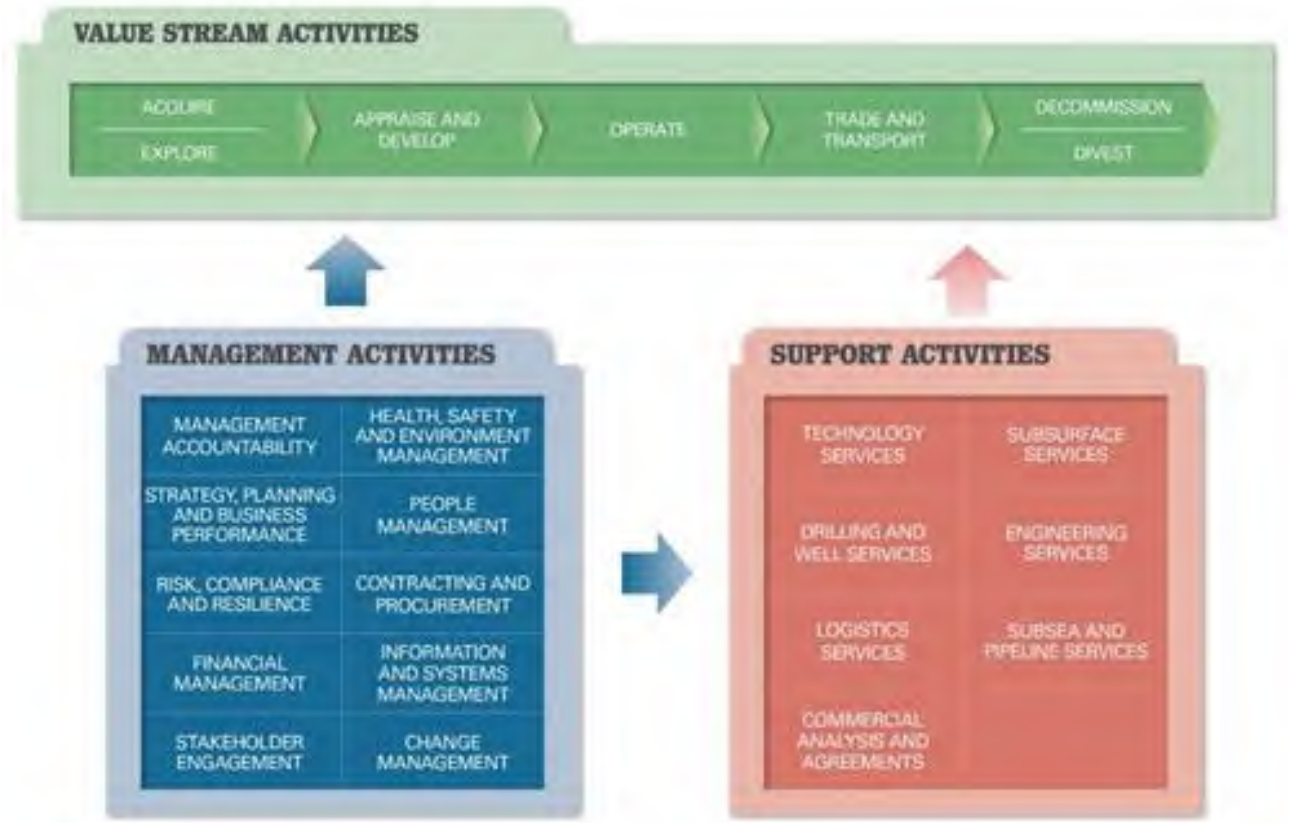



**Figure 1-2: The WMS business process hierarchy**

### 1.9.1 Environment and Biodiversity Policy

In accordance with Regulation 16(a) of the Environment Regulations, Woodside's Corporate Environment and Biodiversity Policy is provided in **Appendix A** of this EP.

## 1.10 Description of Relevant Requirements

In accordance with Regulation 13(4) of the Environment Regulations, a description of requirements, including legislative requirements, that apply to the activity and relevant to the management of risks and impacts of the Petroleum Activities Program are detailed in **Appendix B.**

### 1.10.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) provides the regulatory framework for all offshore petroleum exploration and production and greenhouse gas activities in Commonwealth waters (the ocean area beyond three nautical miles to the outer extent of the Australian Exclusive Economic Zone at 200 nautical miles).

The Act manages all offshore petroleum activities, including decommissioning, under Section 572 and 270. While there are no immediate plans for decommissioning (the scope of this EP is for drilling production wells for future operations) all equipment being installed above the mudline has been designed to allow removal. Subsection 572(2) provides that while structures, equipment and other property remain in the title area, they must be maintained in good condition and repair. Inspection, maintenance and repair of the infrastructure installed for future production, under this Environment Plan, will be managed as described in **Section 3.7**.

The regulatory framework establishes the National Offshore Petroleum Safety and Environment Management Authority as the regulator. Under the OPGGS Act, the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations* 2009 (the Environment Regulations), apply to

petroleum activities in Commonwealth waters and are administered by NOPSEMA. The objective of the Environment Regulations is to ensure petroleum activities are:

- consistent with the principles of ecologically sustainable development (as set out in the EPBC Act)
- by which the environmental impacts and risks of the activity will be reduced to ALARP
- by which the environmental impacts and risks of the activity will be of an acceptable level.

### 1.10.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

One of the objectives of the EPBC Act is to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places in Australia. These are defined under Part 3 of the Act as "Matters of National Environmental Significance" (MNES). The EPBC Act sets a regime which aims to ensure actions taken on (or impacting upon) Commonwealth land or waters are consistent with the principles of ecological sustainable development. When a person proposes to take an action that they believe may need approval under the EPBC Act, they must refer the proposal to the Commonwealth Minister for Environment.

In relation to offshore petroleum activities in Commonwealth waters, in accordance with the "Streamlining Offshore Petroleum Approvals Program" (the Program), requirements under the EPBC Act are now administered by NOPSEMA, commencing February 2014. The Program requires any offshore petroleum activities, authorised by the OPGGS Act to be conducted in accordance with an accepted EP. The definition of 'environment' in the Program covers all matters protected under Part 3 of the EPBC Act.

#### 1.10.2.1 Offshore Project Proposal

Woodside submitted the Scarborough OPP to NOPSEMA for assessment in February 2019, which was accepted in March 2020. The OPP provided the detail and evaluation of potential impacts and risks from the key components of the Scarborough Development. These key components include:

- Wells – drilling of the Scarborough and North Scarborough gas fields, with potential for future fields (including Thebe and Jupiter gas fields) to be tied back to the facility
- Trunkline installation – installation of a gas trunkline to extend for a total of 430 km using trenching and backfill (for nearshore only)
- Surface infrastructure – Floating Production Unit (FPU) in approximately 900 m of water over the Scarborough reservoir
- Subsea infrastructure - infield infrastructure, including wellheads, manifolds, flowlines and umbilicals, trunkline and communications lines
- Commissioning – Commissioning of the overall production system will be conducted from the FPU once on location
- Operations – hydrocarbon extraction and processing will take place at the FPU, to meet the trunkline specifications. Gas will be exported via the trunkline.
- Decommissioning - the facilities will be decommissioned in accordance with good oilfield practice and relevant legislation and practice at the time

In accordance with Regulation 9 and 6 a titleholder must have submitted and have an accepted EP in place before commencing an activity. Therefore, a number of EPs will be developed and submitted to NOPSEMA over the next 5 years, to cover components of the Scarborough Development, such as those listed above, including commissioning and operations of the FPU.

Each EP will have a defined Petroleum Activities Program and will detail and evaluate the risks and impacts, demonstrating they have been reduced to ALARP and are acceptable for that particular

petroleum activity program. The Scarborough OPP sets out the environmental performance outcomes (EPOs) for the project and the level of performance to be achieved, to ensure that environmental impacts and risks will be of an acceptable level and the project is consistent with the principles of ecologically sustainable development. These EPOs will be adopted into each EP, where relevant to the particular scope of the EP.

In accordance with Regulation 31 of the Environment Regulations, references to the Scarborough OPP have been made throughout this EP. The accepted OPP is available on the NOPSEMA website: Scarborough Offshore Project Proposal » NOPSEMA.

#### 1.10.2.2 Recovery Plans and Threat Abatement Plans

Under s139(1)(b) of the EPBC Act, the Environment Minister must not act inconsistently with a recovery plan for a listed threatened species or ecological community or a threat abatement plan for a species or community protected under the Act. Similarly, under s268 of the EPBC Act:

*"A Commonwealth agency must not take any action that contravenes a recovery plan or a threat abatement plan."*

In respect to offshore petroleum activities in Commonwealth waters, these requirements are implemented by NOPSEMA via the commitments included in the Program. Commitments relating to listed threatened species and ecological communities under the Act are included in the Program Report (Commonwealth of Australia, 2014).

#### 1.10.2.3 Australian Marine Parks

Under the EPBC Act, Australian Marine Parks (AMPs), formally known as Commonwealth Marine Reserves, are recognised for conserving marine habitats and the species that live and rely on these habitats. The Director of Marine Parks (DNP) is responsible for managing AMP's (supported by Parks Australia), and is required to publish management plans for them. Other parts of the Australian Government must not perform functions or exercise powers in relation to these parks that are inconsistent with management plans (s.362 of the EPBC Act). Relevant AMPs are identified in **Section 4.8** and described in **Appendix I.** The North-west Marine Parks Network Management Plan (DNP, 2018a) describe the requirements for managing the marine parks that are relevant to this EP.

Specific zones within the AMPs have been allocated conservation objectives as stated below (International Union for Conservation of Nature (IUCN) Protected Area Category) based on the Australian IUCN reserve management principles outlined in Schedule 8 of the EPBC Regulations 2000:

- Special Purpose Zone (IUCN category VI)—managed to allow specific activities though special purpose management arrangements while conserving ecosystems, habitats and native species. The zone allows or prohibits specific activities.
- Sanctuary Zone (IUCN category Ia)—managed to conserve ecosystems, habitats and native species in as natural and undisturbed a state as possible. The zone allows only authorized scientific research and monitoring.
- National Park Zone (IUCN category II)—managed to protect and conserve ecosystems, habitats and native species in as natural a state as possible. The zone only allows nonextractive activities unless authorised for research and monitoring.
- Recreational Use Zone (IUCN category IV)—managed to allow recreational use, while conserving ecosystems, habitats and native species in as natural a state as possible. The zone allows for recreational fishing, but not commercial fishing.
- Habitat Protection Zone (IUCN category IV)—managed to allow activities that do not harm or cause destruction to seafloor habitats, while conserving ecosystems, habitats and native species in as natural a state as possible.

- Multiple Use Zone (IUCN category VI)—managed to allow ecologically sustainable use while conserving ecosystems, habitats and native species. The zone allows for a range of sustainable uses, including commercial fishing and mining where they are consistent with park values.

# 2 ENVIRONMENT PLAN PROCESS

## 2.1 Overview

This section outlines the process Woodside follows to prepare the EP once an activity has been defined as a petroleum activity. The process (**Section 2.2**) describes the environmental risk assessment methodology that is used to identify, analyse and evaluate risks to meet ALARP and acceptability requirements and to develop EPOs and EPSs. This section also describes Woodside's risk management methodologies applicable to implementation strategies applied during the activity.

Regulation 13(5) of the Environment Regulations requires the detailing of environmental impacts and risks, and evaluation appropriate to the nature and scale of each impact and risk associated with the Petroleum Activities Program and potential emergency conditions. The objective of the risk assessment process, described in this section, is to identify risks and associated impacts of an activity, so that they can be assessed, and appropriate control measures applied to eliminate, control or mitigate the impact/risk to ALARP and determine if the impact or risk level is acceptable.

Environmental impacts and risks assessed include those directly and indirectly associated with the Petroleum Activities Program and includes potential emergency and accidental events. This may include environment impacts and risks that are a result of the proposed activity but are not within Woodside's control.

- Planned activities (routine and non-routine) have the potential for inherent environmental impacts.
- An environmental risk is an unplanned event with the potential for impact (termed risk 'consequence').

Herein, the potential result of planned activities are termed 'impacts', where-as 'risks' are associated with unplanned events with the potential for impact (should the risk be realised); with such potential impacts termed 'consequence'.

## 2.2 Environmental Risk Management Methodology

An assessment of the impacts and risks associated with the Petroleum Activities Program has been undertaken in accordance with Woodside's Environment Impact Assessment Guideline and Risk Management Procedure. This guideline and procedure set out the broad principles and high-level steps for assessing environmental impacts across the lifecycle of Woodside's activities and managing these during project execution.

The key steps of the Woodside impact and risk management process are comprised of the:

- environmental impact and risk assessment
- communication and consultation that informs the assessment and ongoing environmental performance of the activity
- steps required during implementation of the activity including to monitor, review and report.

### 2.2.1 Establish the Context

Context is established by considering the proposed activities associated with a Petroleum Activities Program, and the environment in which the activities are planned to take place.

Describing the activity involves the evaluation of whether the activity meets the definition of a "petroleum activity" as defined in the Environment Regulations. The activity is then described in relation to the location, what is to be undertaken and how - this allows for the identification of environmental **aspects** for each activity.

### 2.2.2 Review of the Significance/Sensitivity of Receptors and Levels of Protection

Sensitivity of receptors relevant to the Scarborough Project, and this Petroleum Activities Program, was determined during development of the Scarborough OPP. As set out within the OPP, the sensitivity of all project receptors, was determined to be either low, medium or high based on qualitative expert judgement.

During development of this EP, OPP receptor sensitivity determinations were reviewed in the context of any changing legislation or changed knowledge regarding the sensitivity of each receptor. No relevant factors that would change receptor sensitivity (from that determined in the OPP) were identified. Receptor sensitivity determinations from the OPP are used in the risk impact assessment summaries for each environmental risk assessment (refer to **Section 6**).

### 2.2.3 Environmental Legislation and Other Requirements

In preparing this EP, Woodside has ensured the proposed controls and impact and risk levels are consistent with national and international standards, law and policies (including applicable plans for management and conservation advices, and significant impact guidelines for MNES).

This has included developing the project in accordance with all applicable legislation as identified in **Section 1.10**, and ensuring the requirements of the species recovery plans and conservation advices have been considered to identify any requirements that may be applicable to the risk assessment.

### 2.2.4 Impact and Risk Identification

Terminology used for this impact and risk assessment has been taken from the impact and risk management process, which is aligned with ISO 13001:2018 and the requirements of Part 2 (regulations 6 to 25A) of the OPPGS Regulations.

Impacts and risks of the Scarborough Project were identified in the scoping phase of the Scarborough Project (and presented within the OPP). During this phase, the relationships between the environmental aspects identified for the proposed activities and the associated potential impacts and risks for each receptor are established. This EP considers relevant impacts and risks associated with the Scarborough Project's Drilling and Completions Campaign.

Using the OPP as a guide, all impacts and risks associated with the Petroleum Activities Program for this EP were identified during the EP scoping phase by undertaking an Environmental Risk and Impact Identification (ENVID) workshop. Impacts, risks and potential consequences were identified based on planned and potential interaction with the activity (based on the description in **Section 3**), the existing environment (**Section 4**) and the outcomes of Woodside's consultation process (**Section 5**). The ENVID workshop was undertaken by a multidisciplinary team comprising personnel with sufficient breadth of knowledge, training and experience to reasonably assure that the hazards that may arise in connection with the Petroleum Activity Program in this EP were identified.

Impacts and risks were identified during the ENVID for both planned (routine and non-routine) activities and unplanned (accidents/incidents/emergency conditions) events. During this process, risks identified as not applicable (not credible) were removed from the assessment.

## 2.3 Impact and Risk Analysis and Evaluation

After identifying impacts and risks, analysis and evaluation is undertaken to determine the extent of the impacts and risks, whether they are acceptable or not, and to identify any impact and risk treatment (or controls) to be implemented.

Impact and risk evaluation are undertaken by assessing the magnitude (i.e. no lasting effect, slight, minor, moderate, major or catastrophic) of the credible environmental impacts from each aspect based on extent, duration, frequency and scale, and then either:

- assigning an impact significance level to each credible environmental impact based on the receptor sensitivity and the magnitude of the impact, OR
- assigning an environmental risk level to each environmental risk based on the receptor sensitivity, magnitude of the consequence, and the likelihood of occurrence.

### 2.3.1 Impact Evaluation

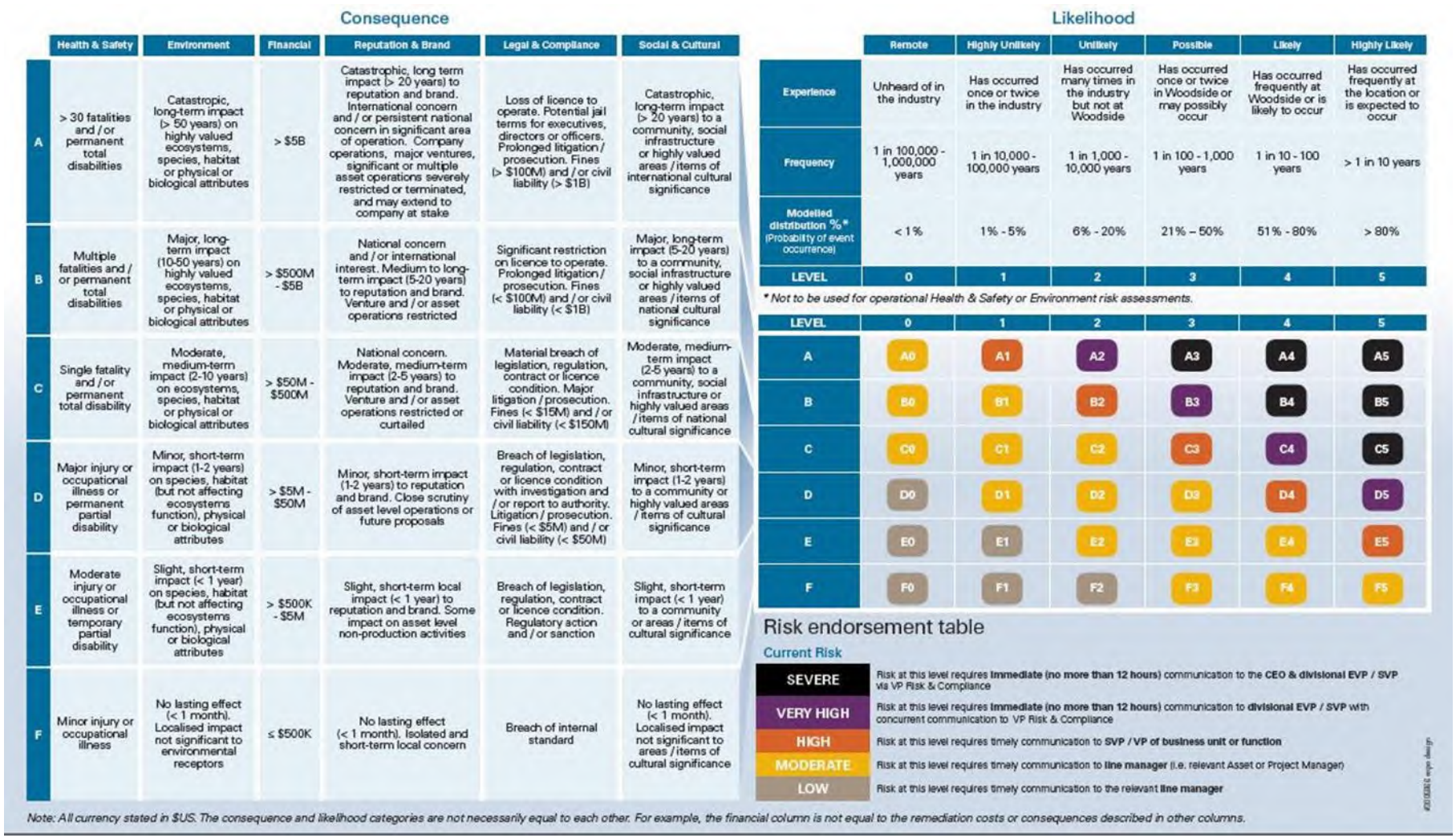
Impact assessment determines the impact significance of the potential impacts, based on the magnitude and the receptor sensitivity (**Figure 2-1**).

| | Receptor Sensitivity | | | |
|---|---|---|---|---|
| **Magnitude** | Low | Medium | High | **Significance Level** |
| Catastrophic | B | A | A | Catastrophic (A) |
| Major | C | B | A | Major (B) |
| Moderate | D | C | B | Moderate (C) |
| Minor | E | D | C | Minor (D) |
| Slight | F | E | D | Slight (E) |
| No lasting effect | F | F | E | Negligible (F) |

**Figure 2-1:Impact significance level**

### 2.3.2 Risk Evaluation

In support of ongoing risk management (a key component of Woodside's Process Safety Management Framework – refer to Implementation Strategy (**Section 7**)), Woodside uses the concept of 'current risk' and applies a current risk rating to indicate the current or 'live' level of risk, considering the controls that are currently in place and regularly effective. Current risk rating is effective in articulating potential divergence from baseline risk, such as if certain controls fail or could potentially be compromised. Current risk ratings aid in the communication and visibility of the risk events, and ensures risk is continually managed to ALARP by identifying risk reduction measures and assessing acceptability.



## Consequence

| | Health & Safety | Environment | Financial | Reputation & Brand | Legal & Compliance | Social & Cultural |
|---|---|---|---|---|---|---|
| A | > 30 fatalities and / or permanent total disabilities | Catastropic, long-term impact (> 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes | > $5B | Catastrophic, long term impact (> 20 years) to reputation and brand. International concern and / or persistent national concern in significant area of operation. Company operations, major ventures, significant or multiple asset operations severely restricted or terminated, and may extend to company at stake | Loss of licence to operate. Potential jail terms for executives, directors or officers. Prolonged litigation / prosecution. Fines (> $100M) and / or civil liability (> $1B) | Catastrophic, long-term impact (> 20 years) to a community, social infrastructure or highly valued areas / items of international cultural significance |
| B | Multiple fatalities and / or permanent total disabilities | Major, long-term impact (10-50 years) on highly valued ecosystems, species, habitat or physical or biological attributes | > $500M - $5B | National concern and / or international interest. Medium to long-term impact (5-20 years) to reputation and brand. Venture and / or asset operations restricted | Significant restriction on licence to operate. Prolonged litigation / prosecution. Fines (< $100M) and / or civil liability (< $1B) | Major, long-term impact (5-20 years) to a community, social infrastructure or highly valued areas / items of national cultural significance |
| C | Single fatality and / or permanent total disability | Moderate, medium-term impact (2-10 years) on ecosystems, species, habitat or physical or biological attributes | > $50M - $500M | National concern. Moderate, medium-term impact (2-5 years) to reputation and brand. Venture and / or asset operations restricted or curtailed | Material breach of legislation, regulation, contract or licence condition. Major litigation / prosecution. Fines (< $15M) and / or civil liability (< $150M) | Moderate, medium-term impact (2-5 years) to a community, social infrastructure or highly valued areas / items of national cultural significance |
| D | Major injury or occupational illness or permanent partial disability | Minor, short-term impact (1-2 years) on species, habitat (but not affecting ecosystems function), physical or biological attributes | > $5M - $50M | Minor, short-term impact (1-2 years) to reputation and brand. Close scrutiny of asset level operations or future proposals | Breach of legislation, regulation, contract or licence condition with investigation and / or report to authority. Litigation / prosecution. Fines (< $5M) and / or civil liability (< $50M) | Minor, short-term impact (1-2 years) to a community or highly valued areas / items of cultural significance |
| E | Moderate injury or occupational illness or temporary partial disability | Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystems function), physical or biological attributes | > $500K - $5M | Slight, short-term local impact (< 1 year) to reputation and brand. Some impact on asset level non-production activities | Breach of legislation, regulation, contract or licence condition. Regulatory action and / or sanction | Slight, short-term impact (< 1 year) to a community or areas / items of cultural significance |
| F | Minor injury or occupational illness | No lasting effect (< 1 month). Localised impact not significant to environmental receptors | ≤ $500K | No lasting effect (< 1 month). Isolated and short-term local concern | Breach of internal standard | No lasting effect (< 1 month). Localised impact not significant to areas / items of cultural significance |

## Likelihood

| | Remote | Highly Unlikely | Unlikely | Possible | Likely | Highly Likely |
|---|---|---|---|---|---|---|
| Experience | Unheard of in the industry | Has occurred once or twice in the industry | Has occurred many times in the industry but not at Woodside | Has occurred once or twice in Woodside or may possibly occur | Has occurred frequently at Woodside or is likely to occur | Has occurred frequently at the location or is expected to occur |
| Frequency | 1 in 100,000 - 1,000,000 years | 1 in 10,000 - 100,000 years | 1 in 1,000 - 10,000 years | 1 in 100 - 1,000 years | 1 in 10 - 100 years | > 1 in 10 years |
| Modelled distribution %* (Probability of event occurrence) | < 1% | 1% - 5% | 6% - 20% | 21% – 50% | 51% - 80% | > 80% |
| LEVEL | 0 | 1 | 2 | 3 | 4 | 5 |

** Not to be used for operational Health & Safety or Environment risk assessments.*

| LEVEL | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| A | A0 | A1 | A2 | A3 | A4 | A5 |
| B | B0 | B1 | B2 | B3 | B4 | B5 |
| C | C0 | C1 | C2 | C3 | C4 | C5 |
| D | D0 | D1 | D2 | D3 | D4 | D5 |
| E | E0 | E1 | E2 | E3 | E4 | E5 |
| F | F0 | F1 | F2 | F3 | F4 | F5 |

## Risk endorsement table

Current Risk

| | |
|---|---|
| SEVERE | Risk at this level requires **immediate (no more than 12 hours)** communication to the **CEO & divisional EVP / SVP** via VP Risk & Compliance |
| VERY HIGH | Risk at this level requires **immediate (no more than 12 hours)** communication to **divisional EVP / SVP** with concurrent communication to VP Risk & Compliance |
| HIGH | Risk at this level requires timely communication to **SVP / VP of business unit or function** |
| MODERATE | Risk at this level requires timely communication to **line manager** (i.e. relevant Asset or Project Manager) |
| LOW | Risk at this level requires timely communication to the relevant **line manager** |

*Note: All currency stated in $US. The consequence and likelihood categories are not necessarily equal to each other. For example, the financial column is not equal to the remediation costs or consequences described in other columns.*

**Figure 2-2: Environmental risk levels**

### 2.3.3 Decision Support Framework

To support the risk assessment process Woodside's HSE risk management procedures include the use of a decision support framework based on principles set out in the Guidance on Risk Related Decision Making (Oil and Gas UK, 2014). This concept has been applied during the ENVID or equivalent preceding processes during historical design decisions to determine the level of supporting evidence that may be required to draw sound conclusions regarding risk level and whether the risk is ALARP and acceptable. This is to confirm:

- activities do not pose an unacceptable environmental risk
- appropriate focus is placed on activities where the risk is anticipated to be acceptable and demonstrated to be ALARP
- appropriate effort is applied to the management of risks based on the uncertainty of the risk, the complexity and risk rating (i.e. potential higher order environmental impacts are subject to further evaluation assessment).

The framework provides appropriate tools, commensurate to the level of uncertainty or novelty associated with the risk (referred to as Decision Type A, B or C). The decision type is selected based on an informed discussion around the uncertainty of the risk, then documented in ENVID output.

This framework enables Woodside to appropriately understand a risk, determine if the risk is acceptable and can be demonstrated to be ALARP.

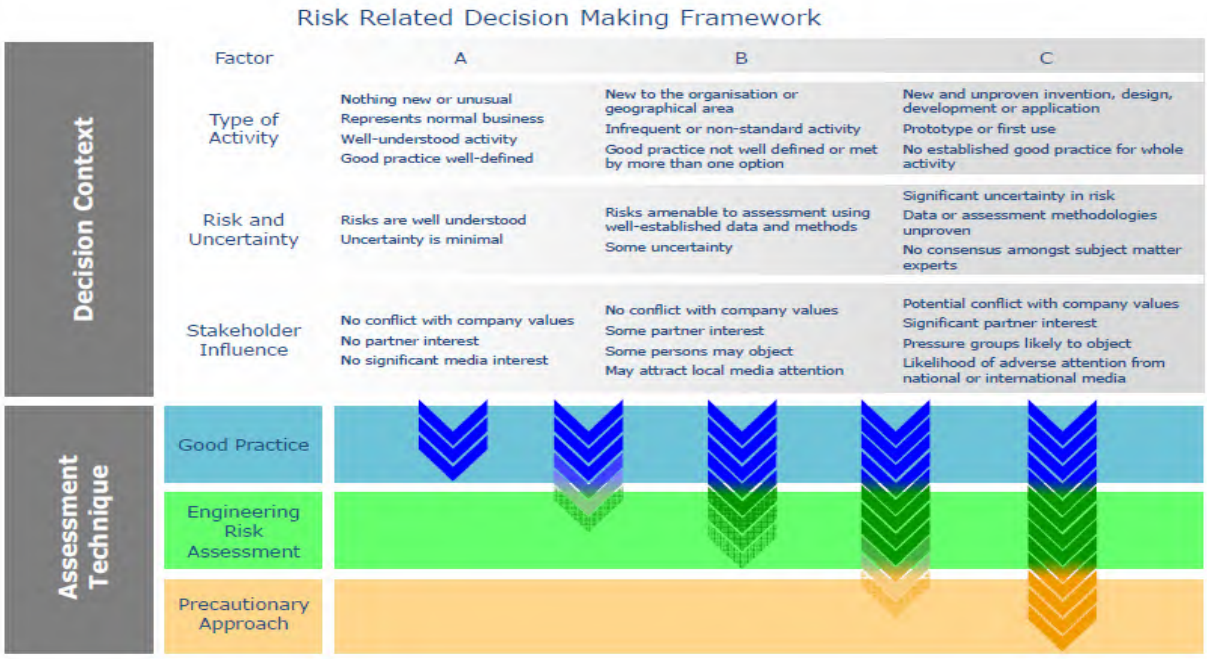



**Figure 2-3: Risk related decision-making framework (Oil and Gas UK, 2014)**

Decision Type A

Risks classified as a Decision Type A are well understood and established practice, they generally consider recognised good industry practice which is often embodied in legislation, codes and standards and use professional judgement.

Decision Type B

Risks classified as Decision Type B typically involve greater uncertainty and complexity (and can include potential higher order impacts/risks). These risks may deviate from established practice or

have some lifecycle implications, and therefore require further engineering risk assessment to support the decision and ensure the risk is ALARP. Engineering risk assessment tools may include:

- risk-based tools such as cost based analysis or modelling
- consequence modelling
- reliability analysis
- company values.

Decision Type C

Risks classified as a Decision Type C typically have significant risks related to environmental performance. Such risks typically involve greater complexity and uncertainty; therefore, requiring adoption of the precautionary approach. The risks may result in significant environmental impact; significant project risk/exposure or may elicit negative stakeholder concerns. For these risks, in addition to Decision Type A and B tools, company and societal values need to be considered by undertaking broader internal and external consultation as part of the risk assessment process.

### 2.3.4 Demonstration of ALARP

Descriptions have been provided below (**Table 2-1**) to articulate how Woodside demonstrates different risks, impacts and Decision Types identified within the EP are ALARP.

**Table 2-1: Summary of Woodside's criteria for ALARP demonstration**

| Risk | Impact | Decision Type |
|---|---|---|
| ***Low and Moderate*** | ***Negligible, Slight, or Minor (D, E or F)*** | ***A*** |
| Woodside demonstrates these Risks, Impacts and Decision Types are reduced to ALARP if:<br>• controls identified meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines<br>• further effort towards impact/risk reduction (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained. | | |
| ***High, Very High or Severe*** | ***Moderate and above (A, B or C)*** | ***B and C*** |
| Woodside demonstrates these higher order Risks, Impacts and Decision Types are reduced to ALARP (where it can be demonstrated using good industry practice and risk-based analysis) that:<br>• legislative requirements, applicable company requirements and industry codes and standards are met<br>• societal concerns are accounted for<br>• the alternative control measures are grossly disproportionate to the benefit gained. | | |

### 2.3.5 Demonstration of Acceptability

Acceptability of the Scarborough Project, including the Petroleum Activities Program described in this EP, was demonstrated in the Scarborough OPP (SA0006AF0000002, Rev 5) as required by Environment Regulation 5D (6). The EPOs set in the OPP demonstrate that the environment impacts and risks of the project will be managed to an acceptable level.

The impacts and risks of Scarborough were determined to be acceptable in the OPP through consideration of the following evaluation criteria (Scarborough OPP (SA0006AF0000002, Rev 5; Section 6.4.4)

- Principles of Ecologically Sustainable Development (ESD) as defined under the EPBC Act
- internal context – the proposed impacts and risk levels are consistent with Woodside policies, procedures and standards
- external context – consideration of the environment consequence and stakeholder acceptability

- other requirements – the proposed controls and impact and risk levels are consistent with national and international standards, laws, policies and Woodside Standards (including applicable plans for management and conservation advices, and significant impact guidelines for MNES)

In this EP Woodside has demonstrated that the level of acceptability determined in the OPP has been met through the following criteria:

- Adoption of relevant OPP EPOs and controls
- Adoption of EP specific controls where required
- Impact Significance Level / Risk Consequence levels for receptors are equal to or less than the significant impact level defined in the Scarborough OPP (SA0006AF0000002, Rev 5; Section 6.5; Table 6-3) and are therefore consistent with the EPOs and managed to an acceptable level of impact or risk, and
- Consideration of internal/external context and other requirements specific to this EP Petroleum Activities Program (including issues raised during EP Consultation).

A summary of the process as adopted is shown in **Table 2-2.**

**Table 2-2: Summary of Woodside's criteria for Acceptability for Scarborough EPs**

| Risk | Impact | Decision Type |
|---|---|---|
| ***Low and Moderate*** | ***Negligible, Slight, or Minor (D, E or F)*** | ***A*** |
| Woodside demonstrates these Risks, Impacts and Decision Types are 'Broadly Acceptable' if they meet the EP criteria listed above in **Section 2.3.5**. Further effort towards risk reduction (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained. | | |
| ***High, Very High or Severe*** | ***Moderate and above (A, B or C)*** | ***B and C*** |
| Woodside demonstrates these higher order Risks, Impacts and Decision Types are 'Acceptable if ALARP' if they meet the EP criteria listed above in **Section 2.3.5**. In addition, these higher order risks, impacts and decision types are 'Acceptable if ALARP' if it can be demonstrated that the predicted levels of impact and/or residual risk, are managed to ALARP (as described in **Section 2.3.4**).<br>For potential C or above consequence/impact levels where significant uncertainty exists in analysis of the risk or impact (such as, for predicted or potential high risk of significant environmental impacts, significant project risk/exposure, novel activities, lack of consensus on standards, and significant stakeholder concerns [e.g. Decision Type C]), defined acceptable levels and assessment of acceptability may be required to be conducted separately for key receptors. | | |

## 2.4 Recovery Plan and Threat Abatement Plan Assessment

To support the demonstration of acceptability, a separate assessment is undertaken to demonstrate that the EP is not inconsistent with any relevant recovery plans or threat abatement plans (refer **Section 1.10.2.2**). The steps in this process are:

- identify relevant listed threatened species and ecological communities (**Section 4.6**; **Appendix I**);
- identify relevant recovery plans and threat abatement plans (**Appendix I**);
- list all objectives and (where relevant) the action areas of these plans, and assess whether these objectives/action areas apply to government, the Titleholder, and the Petroleum Activities Program (**Section 6.9**); and
- for those objectives/action areas applicable to the Petroleum Activities Program, identify the relevant actions of each plan, and evaluate whether impacts and risks resulting from the activity are clearly not inconsistent with that action (**Section 6.9**).

## 2.5 Environmental Performance Objectives/Outcomes, Standards and Measurement Criteria

The OPGGS Environment Regulations define EPOs to mean: "*a measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level*". As such, the process of defining an appropriate EPO, has relied on the required levels of performance set either in legislation (such as the OPGGS Act), regulator guidance notes such as the Matters of National Environmental Significance– Significant Impact Guidelines (DotE, 2013) or may be the result of specific agreements or expectations with other relevant persons and/ or organisations (e.g. fishers or other marine users).

EPOs for the Scarborough Project have been set within the Scarborough OPP (SA0006AF0000002, Rev 5) and assessed as meeting the requirements of the Regulations to be appropriate, consistent with the principles of ecologically sustainable development and to demonstrate that the environmental impacts and risks of the project will be managed to an acceptable level.

Environment Plans for petroleum activities submitted subsequent to the OPP process are required to contain EPOs that are appropriate by being consistent with those set out in the OPP. The EPOs presented in a subsequent EP are not required to be exactly the same however should achieve the same environmental outcome (or better) as that described in the OPP. Activity specific EPs will also be required to contain measurement criteria and performance monitoring, auditing and reporting processes relating to the EPOs.

Table 6-2 shows a comparison between EPOs in the Scarborough OPP (SA0006AF0000002, Rev 5) and this EP.

# 3 DESCRIPTION OF THE ACTIVITY

## 3.1 Overview

This section has been prepared in accordance with Regulation 13(1) of the Environment Regulations and describes the activities to be undertaken as part of the Petroleum Activities Program under this EP. It includes the location of the activities, operational details and additional information relevant to considering environmental risks and impacts.

## 3.2 Project Overview

Woodside proposes to develop and produce hydrocarbons from the Scarborough field Permit Area WA-61-L.

The Petroleum Activities Program will involve drilling and installation of up to ten Scarborough development wells (eight planned wells and two contingency wells) and installation of a subsea xmas tree upon each well.

If required, Woodside may also need to intervene, workover or re-drill the proposed development wells within Permit Area WA-61-L to monitor and maintain their integrity and mechanically alter them as required.

An overview of the Petroleum Activities Program is provided in **Table 3-1**.

**Table 3-1: Petroleum Activities Program Overview**

| Item | Description |
|---|---|
| ***Permit Titles*** | WA-61-L |
| ***Location*** | North West Shelf |
| ***Water depth*** | Approx. 900–955 m |
| ***Number of wells*** | Scarborough development wells drilling and completions including:<br>• eight development wells and the potential for two additional development wells (contingency). |
| ***Subsea infrastructure*** | Subsea xmas tree at each well |
| ***MODU*** | Dynamic Positioned (DP) MODU with contingency for moored MODU, depending on availability and suitability for the development well locations |
| ***Vessels*** | • Installation vessel for installing the subsea infrastructure.<br>• Light well intervention vessel as an option for well intervention, subsea hardware installation or contingent activities.<br>• Support vessels including anchor handling vessel(s) and general supply/support vessels. |
| ***Key activities*** | • Top hole section drilling.<br>• Installation of blow-out preventer (and marine riser).<br>• Bottom hole section drilling.<br>• Completion and well unload activities.<br>• Installation of subsea xmas trees.<br>• Formation evaluation while drilling.<br>• Temporary suspension or permanent abandonment of well (planned or if necessary, for unforeseen circumstances).<br>• Contingent activities including pre-lay anchors by anchor handling vessel, anchor hold testing and mooring (in case of moored MODU); intervention, workover, well re-drill, wireline logging and installation of up to two additional development wells. |

## 3.3 Concordance with the Scarborough OPP

The OPP describes the scope of the Scarborough project and its component activities, at a level comprehensive enough to facilitate thorough evaluation of environmental impacts and risks and appropriate setting of EPOs. However, in accordance with NOPSEMA guidance, it is acknowledged that an OPP is prepared at an early stage in project development, before detailed planning of component activities has occurred. More detailed descriptions of the component activities are therefore expected in subsequent EPs.

Refinement or modifications to methods or timing for individual project activities may occur after an OPP acceptance and before the submission of EPs. These refinements or modifications to the accepted project cannot be new activities and cannot significantly change the overall environmental impacts and risks of the project as described in the accepted OPP. **Table 3-2** shows which scopes from the OPP may have progressed in level of definition from the time the OPP was authored.

Section 4 of the Scarborough OPP (SA0006AF0000002, Rev 5) provides a detailed description of the Scarborough project.

**Table 3-2: Concordance of activities described in the Scarborough OPP with those included in this EP**

| Scarborough OPP Section | Scope or overview of the Activity | Relevance to this EP | Refinement or modification to methods | Refinement or modification to timing | Is this a new activity | Significance of change |
|---|---|---|---|---|---|---|
| 4.4.3 Drilling Activities | Drilling of 7 Phase 1 Development wells | It is now proposed that 8 development wells be drilled as part of Phase 1, with potential for two additional contingent wells. This is within the scope of the total well count assessed by the OPP (30 wells) however is slightly more than the original estimate for the first drilling phase provided in Table 4-8 of the description of Drilling Activities. | No | Yes | No | No. Minor change in project execution phasing which does not affect impact or risk profile as it was assessed in the OPP. |
| Table 7-63 Well cuttings and fluid volumes discharged | Table 7-63 in the OPP estimates cuttings and fluid volumes that might be discharged for an example Scarborough well.<br>The volumes quoted in Table 7-63 are described as “estimates only, for the purpose of undertaking an assessment of the environmental impacts. Detailed design will be undertaken further and the assessment updated in relevant activity EPs”. | This EP provides an update on previous estimates of cuttings and fluid discharges during drilling activities, which were used in OPP risk assessment.<br>The more recent estimation of cuttings and fluids are higher than original estimates due to refinement in well design - particularly some interval lengths have increased i.e. the 26″ surface hole goes deeper into the Muderong, which will generate more cuttings, being a longer section of a larger hole. | Yes | No | No | No. Refer to **Section 6.7.7** which shows overall environmental impact significance level is consistent with OPP assessment. |
| 4.4.3.4 Bottom Hole Section Drilling | The OPP does not detail Formation Evaluation, which is carried out once well total depth is reached, to determine the presence and quantity of hydrocarbons in a reservoir.<br>In Table 3-1 in the OPP which lists relevant legislation, it is noted that radioactive tracers may be used during formation evaluation. Well logging as an activity is included in the description of Well Intervention; with wireline listed as a specific example. | In this EP, Formation Evaluation While Drilling (FEWD) is proposed to be carried out, and may include extracting small cores, wireline logging, full diameter cores and other down-hole technologies, as required.<br>Some FEWD tools contain radioactive sources, however, no radioactive material will be released to the environment and radiation fields are not generally detectable outside the tool when the tool is not energised, therefore, they do not present an environmental risk. | Yes | No | No | No. Because Formation evaluation is the interpretation of a combination of measurements taken inside a wellbore once total depth is reached, there are no specific environmental impacts from this activity. |

## 3.4 Location

The Petroleum Activities Program is located in Permit Area WA-61-L in Commonwealth waters, about 374 km west-north-west of Dampier. The closest landfall to the Petroleum Activities Program is the North West Cape, about 226 km south-south-east at its nearest point (**Figure 3-1**Figure). Approximate location details for the Petroleum Activities Program are provided in **Table 3-3**:.

**Table 3-3: Approximate location details for the proposed Scarborough development wells**

| Activity | Water depth (approx. m LAT) | Latitude (WGS84) | Longitude (WGS84) | Petroleum title(s) |
|---|---|---|---|---|
| ***New Development Wells*** | | | | |
| Well 1 | 910 | 19° 53′ 30.499″ S | 113° 08′ 43.568″ E | WA-61-L |
| Well 2 | 912 | 19° 53′ 48.471″ S | 113° 06′ 55.261″ E | WA-61-L |
| Well 3 | 912 | 19° 53′ 18.551″ S | 113° 10′ 03.300″ E | WA-61-L |
| Well 4 | 918 | 19° 52′ 30.359″ S | 113° 06′ 41.412″ E | WA-61-L |
| Well 5 | 918 | 19° 52′ 38.718″ S | 113° 13′ 24.437″ E | WA-61-L |
| Well 6 | 902 | 19° 49′ 27.763″ S | 113° 13′ 08.300″ E | WA-61-L |
| Well 7 | 907 | 19° 45′ 52.900″ S | 113° 14′ 27.449″ E | WA-61-L |
| Well 8 | 909 | 19° 53′ 27.254″ S | 113° 08′ 43.647″E | WA-61-L |
| Contingent wells | Within permit area WA-61-L | | | |

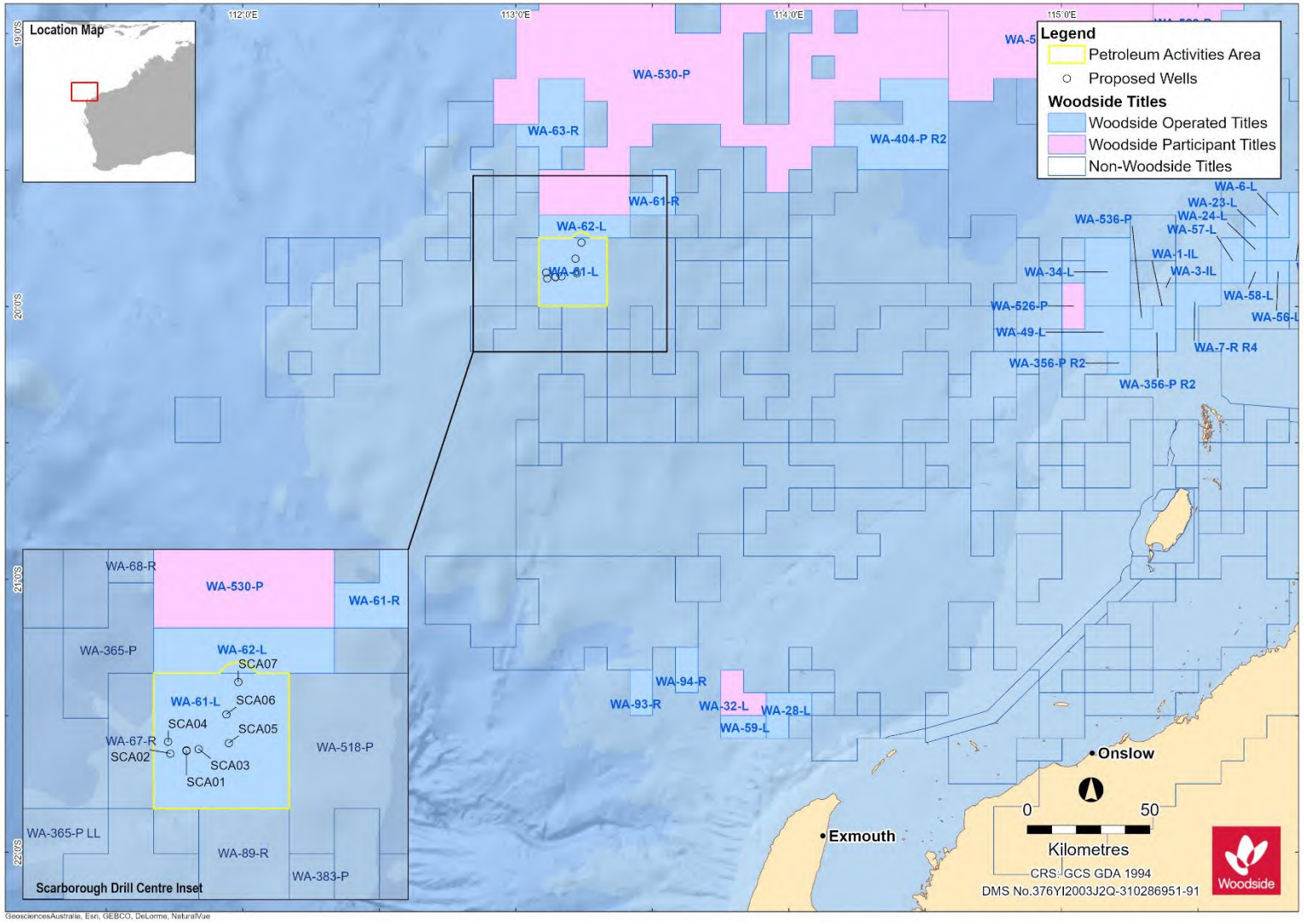



**Figure 3-1: Location of the Petroleum Activities Program**

## 3.5 Operational Areas

The spatial boundary of the Petroleum Activities Program has been described and assessed using two 'areas', the Operational Area and the Permit Area[1]. The combination of the Operational Area and Permit Area defines the spatial boundary of the Petroleum Activities Program, as described and risk assessed by this EP, including vessel related petroleum activities. For the purposes of this EP, the following Operational Areas will apply:

- For a dynamically positioned (DP) MODU, the Operational Area encompasses a radius of 500 m from each well centre, in which drilling related petroleum activities will take place and will be managed under this EP.
- For a moored MODU, the Operational Area encompasses a radius of 4000 m from each well centre, in which drilling related petroleum activities will take place and will be managed under this EP. This increased Operational Area allows for temporary installation of moorings. Noting that the Operational Area will be limited to the western boundary of Permit Area WA-61-L.
- For the installation activities, the Operational Area encompasses a radius of 1500 m around subsea locations, in which subsea installation activities will take place and will be managed under this EP. The 1500 m (radius) Operational Area around subsea installation allows for the movement and positioning of large vessels.

The Operational Area for drilling activities includes a 500 m petroleum safety zone around the MODU to manage vessel movements. The 500 m petroleum safety zone is under the control of the MODU Person in Charge.

The Operational Area and Permit Area are collectively referred to as the Petroleum Activity Area (PAA) in this EP, with specific Operational Areas referred to where relevant. Vessel-related activities within the Operational Areas will comply with this EP. Vessels supporting the Petroleum Activities Program when outside the Operational Area must adhere to applicable maritime regulations and other requirements.

## 3.6 Timing

The Petroleum Activities Program is planned to commence within a five-year window, with potential commencement date of H2 2023. Drilling may occur at any time within the five-year period between 2023 and 2028, for which this EP will be active. Wells may not be drilled consecutively (i.e. one well may be drilled and then the program stopped for 12 or more months before recommencing with further wells). Drilling operations for the development wells is expected to take approximately 60 days per well to complete, including mobilisation, demobilisation and contingency. Subsea xmas trees are expected to be installed after completing the relevant sections of the well while the MODU is still in the field. Installation of subsea xmas trees is expected to have a cumulative duration of about 14 days (including mobilisation, demobilisation, and contingency).

When underway activities will be 24 hours per day, seven days per week. Simultaneous Operations (SIMOPS) activities may occur (e.g. drilling and xmas tree installation, with MODU and vessel separated by at least 1 km). Timing and duration of all activities is subject to change due to project schedule requirements, MODU/vessel availability, unforeseen circumstances and weather.

The EP has risk-assessed drilling activities, installation of subsea infrastructure, IMR, support operations and contingency activities such as intervention, workover, or re-drilling activities throughout the year (all seasons) to provide operational flexibility for requirements and schedule changes and MODU/vessel availability.

[1] For the purposes of this EP the Permit Area comprises WA-61-L plus a buffer to incorporate the portion of the Operational Area that extends beyond the north boundary of the Permit Area (Figure). The existing environment of the entire Permit Area plus the defined buffer is considered to provide context for the risk assessment. This approach facilitates assessing environmental risks and impacts for the entire scope, including development drilling of the contingency wells with a moored MODU.

## 3.7 Subsea Inspection, Maintenance, Monitoring and Repair Activities

Subsea infrastructure is designed not to require any significant degree of intervention. However, the infrastructure is inspected and maintained to ensure its integrity and identify any issues before they present a risk of loss of containment. Intervention may be required to repair identified issues. Subsea activities are typically performed from a relevant support vessel via an ROV or divers.

Interventions often require deployment frames/baskets, which are temporarily placed on the seabed. Typically, these have a perforated base with a seabed footprint of about 15 m². They are recovered to the vessel at the end of the activity. Subsea activities are broadly categorised into inspection, monitoring, maintenance and repair; typical IMMR activities are described in the next sections.

### 3.7.1 Inspection

Subsea infrastructure inspections physically verify and assess components to detect changes to the as-installed location and condition by comparing them to previous inspections. The scope and frequency of subsea inspections are determined using risk-based inspection (RBI) methodology, resulting in detailed RBI plans. **Table 3-4** lists typical relevant subsea infrastructure inspections/surveys.

**Table 3-4: Typical inspections/surveys**

| Type of Inspection/Survey | Purpose |
|---|---|
| General visual inspections | Check general infrastructure integrity |
| Close visual inspections | Investigate certain subsea infrastructure components |
| Cathodic protection | Check for corrosion |
| Wall thickness surveys | Monitor the condition of subsea infrastructure. (i.e. ultrasonic testing) |
| Non-destructive testing | Evaluate the properties of material/items using electromagnetic, radio graphic, acoustic resonance technology, ultrasonic, or magnetic equipment |
| Anode sampling | Take samples of anode materials for testing |
| Marine growth sampling | Take samples of marine growth for testing |
| Laser surveys | Conduct dimensional checks on trees etc. and measure proximity |

Inspection methods will not directly result in environmental aspects which could lead to impacts on the environment and are therefore not discussed further. Potential impacts from vessel and ROV operations associated with inspections are described in **Section 3.9.4**.

### 3.7.2 Monitoring

Subsea infrastructure monitoring surveys the physical and chemical environment that a subsea system or component is exposed to, to determine if and when damage may occur, and (where relevant) predict the rate or extent of that damage.

Monitoring activities may include corrosion probes, corrosion mitigation checks, metocean and seismic monitoring, and cathodic protection testing.

Monitoring will not directly result in environmental aspects which could lead to impacts on the environment and are therefore not discussed further. Potential impacts from vessel and ROV operations associated with monitoring are described in **Section 3.9.4**.

## 3.8 Drilling Activities

Well construction activities are conducted in a number of stages, as described below. Detailed well designs will be submitted to the Well Integrity Department of NOPSEMA as part of the approval to drill and the accepted Well Operation Management Plan (WOMP), as required under the Offshore

Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011.

### 3.8.1 Drilling Operations

#### 3.8.1.1 Cement Unit Test

The MODU may be required to perform a cement unit test, or 'dummy cement job' to test the functionality of the cement unit and the MODU's bulk cement delivery system prior to performing an actual cement job. This operation is usually performed after a MODU has been out of operation for an amount of time (warm-stack), if maintenance on the cement unit has been carried out, or if it is the first time a MODU is being used in-country and commissioning of the cement unit system is required.

A 'dummy cement job' involves mixing a sacrificial cement slurry at surface and, once functionality of the cement unit and delivery system has been confirmed, the slurry is discharged through the usual cement unit discharge line (which may be up to 10 m above the sea level) or through drill pipe below sea level. The slurry is usually a mix of cement and water, however, may sometimes contain stabilisers or chemical additives.

#### 3.8.1.2 Top-Hole Section Drilling

Petroleum Activities Program drilling commences with the top-hole section as follows:

1. The MODU arrives and establishes position over the well site.
2. Top-hole sections are drilled riserless using seawater with pre-hydrated bentonite/guar gum or similar sweeps or drilling fluids to circulate drilled cuttings from the wellbore (discharge to seabed during riserless drilling). As a contingency Pump and Dump (PAD) water-based mud may be used if required based on shallow hazards.
3. Once the top-hole sections of the well have been drilled, steel tubulars (called conductor or casing) are inserted into the wellbore and secured in place by pumping cement into the annular space back to about 300 m above the casing shoe or to surface (seabed), which will involve a discharge of excess cement at the seabed.

At some well locations, top-hole section drilling may be batched. Batch drilling is where the same section of each well is drilled one after another, before going back and drilling the next section of each well.

#### 3.8.1.3 Blowout Preventer and Marine Riser Installation

After setting the surface casing, a blowout preventor (BOP) and marine riser is installed on the wellhead. The BOP provides a means for sealing, controlling and monitoring the well during drilling activities. The BOP components are operated using open hydraulic systems (utilising water-based BOP control fluids). Each time a pressure and function test schedule is undertaken approximately 3620 L of water-based fluid is released to the marine environment, of this approximately 4% is control fluid additive. BOP operation includes function and pressure testing approximately every 21 days, and a function test (approx. 2665 L) approximately every seven days, excluding the week a pressure test is conducted.

The marine riser provides a physical connection between the well and MODU. This enables a closed circulation system to be maintained, where weighted water-based muds (WBM) and cuttings can be circulated from the wellbore back to the MODU via the riser.

#### 3.8.1.4 Bottom Hole Section Drilling

A closed system (riser in place) is used for drilling bottom hole sections to the planned wellbore total depth. The plan is for bottom hole sections to be drilled using WBM drilling fluids; however, non water-based mud (NWBM) may also be used.

Protective steel tubulars (casings and liners) are inserted as required. The size, grade, weight, length and inclination of the casing/liner sections within the wellbore is determined by factors such as the geology/subterranean pressures likely to be encountered in the area and any specific information or resource development requirements.

After a string of casing/liner has been installed into the wellbore, it is cemented into place. The casing/liner is then pressure tested. Once the pressure testing is passed, drilling of the next section can resume with the riser in place to circulate drill cuttings and drilling fluids back to the MODU.

Cementing operations are also undertaken to:

- provide annular isolation between hole sections and structural support of the casing/liner as required
- set a plug in an existing well to side-track
- plug a well so it can be suspended/abandoned.

Cement, barite and bentonite is transported as dry bulk to the MODU by the support vessels. Cement is mixed as required by the cementing unit on the MODU and pumped by high pressure pumps to the surface cementing head then directed down the well.

Excess cement, barite and bentonite (dry bulk) after well operations are completed, will either be held onboard and used for subsequent wells; provided to the next operator at the end of the program or discharged to the marine environment. Excess cement, barite and bentonite that does not meet technical requirements during the Petroleum Activities Program may also be bulk discharged to the environment. Bulk discharges of cement, barite and bentonite may occur as a slurry through the usual cement discharge line or blown as dry bulk and discharged.

Cuttings in drilling fluids circulated back to the MODU are separated from the drilling fluids by the solids control equipment (SCE). The SCE comprises shale shakers to remove coarse cuttings from the drilling fluid. After processing by the shale shakers, the recovered fluids from the cuttings may be directed to centrifuges, which are used to remove the finer solids (4.5 to 6 µm). Water-based drill cuttings are usually discharged below the water line and the fluids are recirculated into the fluid system.

#### 3.8.1.5 Drilling Fluids

Drilling muds contain a variety of chemicals, incorporated into the selected drilling fluid system to meet specific technical requirements (e.g. mud weight required to manage pressure, or for borehole stability). All chemicals selected for use have been assessed under Woodside's internal guidelines to ensure potential impacts are acceptable, ALARP and meet Woodside's expectation for environmental performance.

#### 3.8.1.6 Water-Based (WBM) System

The Petroleum Activities Program will use a water-based drilling fluid system as the planned option. WBM is mainly comprised of water (salt or fresh). Some basic additives such as bentonite/guar gum may be added to the water.

The WBM drilling fluid will either be mixed on the MODU or received pre-mixed, then stored and maintained in a series of pits aboard the MODU. The top-hole sections will be drilled riserless with seawater containing pre-hydrated gel sweeps, and cuttings and drilling fluids returned to the seabed. The bottom hole sections may be drilled using WBM in a closed circulation system which enables re-use of the WBM drilling fluids.

WBM drilling fluids that cannot be reused (e.g. due to bacterial deterioration or do not meet required drilling fluid properties), or are mixed in excess of required volumes, may be operationally discharged to the ocean under the MODU's Permit to Work (PTW) system. Opportunities to reuse the WBM drilling fluids at the end of the Petroleum Activities Program are reviewed across current Woodside drilling activities.

WBM may not be able to be reused between drilling sections due to the drilling sequence, technical requirements of the mud (i.e. no tolerance for deterioration of mud during storage) and maintenance of productivity/injectivity.

A number of factors unique to each drilling program will determine the quantities of WBM drilling fluids required and subsequent discharge volumes if no suitable reuse option is available.

### 3.8.1.7 Non Water-Based Mud System (Contingency only)

The decision to use non water-based muds (NWBM) drilling fluids for the bottom hole sections of a particular well is based on various technical factors relevant to wellbore conditions, such as: well temperature, well shape and depth, reactivity of the formation to water and well friction. The technical justification to use NWBM includes but is not limited to consideration of environment, health, safety and waste management.

The use of NWBM drilling fluids is subject to a formal written commercial and/or technical justification approved in accordance with the Best Practice – Overburden Drilling Fluids Environmental Requirements. The main ingredient of NWBM is base oil and, similar to a WBM system, a range of standard solid and liquid additives may be added in the pits to alter specific mud properties for each section of the well. This depends on the conditions encountered while drilling. Where NWBM is used, the base oil will be a Group III synthetic oil (e.g. Saraline 185V), for all development wells.

The NWBM drilling fluid will be primarily mixed onshore (new or re-use existing stock) and transferred to the MODU by a support vessel, where it is stored and maintained in the mud pits. During drilling operations, the NWBM drilling fluid, like the WBM, is pumped by high pressure pumps down the drill string and out through the drill bit, returning via the annulus between the drill string and the casing back to the MODU via the riser.

The used NWBM pumped back to the MODU contains drill cuttings and is pumped to the Solids Control Equipment (SCE), where the drill cuttings are removed before being pumped back to the pits ready for re-use. The technical properties of the NWBM drilling fluids are maintained/altered (e.g. to increase weight) using additives as required when in the mud pits.

The NWBM drilling fluids that cannot be re-used (i.e. do not meet required drilling fluid properties or are mixed in excess of required volumes) are recovered from the mud pits and returned to the shore base for onshore processing, recycling and/or disposal. The mud pits and associated equipment/infrastructure are cleaned when NWBM is no longer required, with wash water treated onboard through SCE prior to discharge with mud pit washings or returned to shore for disposal if discharge criteria cannot be achieved (refer to mud pits below).

### 3.8.1.8 Mud Pits

There are typically a number of mud pits (tanks) on the MODU that provide a capacity to mix, maintain and store fluids required for drilling activities. The mud pits form part of the drilling fluid circulating system. The mud pits and associated equipment/infrastructure are cleaned out at the completion of drilling and completions operations. Mud pit wash residue is operationally discharged with less than 1% oil contamination by volume. Mud pit residue over 1% oil by volume is sent to shore for disposal.

### 3.8.1.9 Drill Cuttings

Drill cuttings generated from the well are expected to range from very fine to very coarse (<1 cm) particle/sediment sizes. Cuttings generated during drilling of the top hole sections are discharged at the seabed. Estimated volumes of drill cuttings that may be discharged during the Petroleum Activities Program are presented in **Table 6-8**.

The bottom hole sections will be drilled with a marine riser that enables cuttings and drilling fluid to be circulated back to the MODU, where the cuttings are separated from the drilling fluids by the SCE. The SCE comprises but is not limited to shale shakers, cuttings dryers and centrifuges. The SCE uses shale shakers to remove coarse cuttings from the drilling mud. After being processed by the

shale shakers, the recovered mud from the cuttings may be directed to centrifuges, which are used to remove fine solids (4.5 to 6 µm). The cuttings are usually discharged below the water line and the mud is recirculated into the fluid system.

If NWBM is needed to drill a well section, the cuttings which are separated from the NWBM via the shakers will also pass through a cuttings dryer and associated SCE, to reduce the average oil on cuttings (only sections using NWBM) to 6.9% wt/wt or less on wet cuttings, prior to discharge.

### 3.8.2 Formation Evaluation

Formation evaluation is the interpretation of a combination of measurements taken inside a wellbore to detect and quantify hydrocarbon presence in the rock adjacent to the well once total depth is reached. Formation Evaluation While Drilling (FEWD) is the process by which the presence and quantity of hydrocarbon in a reservoir is measured according to its response to radioactive and electrical input. It may include extracting small cores, wireline logging, full diameter cores and other down-hole technologies, as required. FEWD tools will be incorporated into the drillstring during development drilling and may include gamma ray, directional deep resistivity, callipers, density-neutron, sonic and tools which can measure formation pressures. Some FEWD tools contain radioactive sources, however, no radioactive material will be released to the environment and radiation fields are not generally detectable outside the tool when the tool is not energised, therefore, they do not present an environmental risk.

There will be no vertical seismic profiling for ongoing field evaluation.

### 3.8.3 Well Clean-out

Prior to installing the lower completion, wells will be displaced from one drilling fluid system to another, or from the drilling fluid system to completion brine. A chemical cleanout pill or fluids train will be circulated between the two fluids, then brine circulated until operational cleanliness specifications are met. Brine is typically a filtered brine with <70 NTU or <0.05% total suspended solids (TSS). This results in a brine and seawater discharge after this operation. Cleanout fluids and completion brine will be captured and stored on the MODU and discharged if oil concentration is less than 1% by volume or returned to shore if discharge requirements cannot be met.

### 3.8.4 Completion

Once a well has been drilled, well completion activities will be undertaken including installation of the lower completion, intermediate completion, upper completion / production tubing, and subsea tree. The well is then pressure tested for integrity prior to well unloading and suspension. Lower completion will be an open hole gravel pack with a viscous water-based fluid.

The wells will be completed with a big bore upper completion. Following installation of the upper completion, two crown plugs are installed in the tubing hanger. Crown plugs will be individually pressure tested to verify as suspension barriers prior to the BOP being removed.

### 3.8.5 Well Flowback

#### 3.8.5.1 General Description

Upon successfully drilling the development wells, all completion and reservoir fluids will be flared or discharged to the environment via the temporary production system. The types of tasks associated with well testing and flowback may include:

- reservoir gas flaring
- reservoir gas venting.

During well flowback activities, all completion and reservoir fluids will be flared or discharged to the environment via the temporary production system. Base oil will be used to underbalance the well.

The base oil column, completion fluids, hydrocarbons and produced/condensed water will be treated for overboard discharge if it meets discharge requirements or flared/burned through the temporary production system on the MODU. Note that the opportunity to unload to the FPU will be considered which could eliminate or reduce well unloading to the MODU (refer to **Section 6.7.2**).

#### 3.8.5.2 Produced / Reservoir Water Disposal

The temporary production system water filtration treatment package will be used to treat produced/reservoir water before discharge. Prior to discharging, the fluids are cycled through an oilbond filtration system and gauge tank. Water filtration is standard practice for well flowback (well unloading) operations. Fluids that cannot be treated or flared will be sent onshore in tanks for disposal.

### 3.8.6 Air Emissions

During well unloading it is expected that gas, condensate, base oil and methanol in the wellbore will be flared and efficiently burned. The flare may be extinguished due to water ingress, lack of pilot (propane), weather impact or equipment failure resulting in cold venting of gas from the flare for several minutes, before the flare can be restarted or venting stopped. After the objectives of the well testing and flowback are achieved, the flow is stopped and the well may be cleaned using a brine that can include several chemicals, such as biocide and surfactant.

### 3.8.7 Subsea Equipment Preservation Chemicals

Following well completion activities, the wells may be left with subsea equipment (such as xmas trees) installed, awaiting pre-commissioning and connection to the Floating Production Unit (FPU). All subsea equipment will contain preservation fluids to prevent corrosion and any other deterioration of the equipment before production.

### 3.8.8 Well Suspension

During drilling activities, wells will be suspended due to batch drilling. Suspension involves establishing suitable barriers, removing the riser and disconnecting the MODU from the well. The BOP may sometimes be left in place to act as a barrier. Suspension may be short term (e.g. in the case of a cyclone) or longer term (more than one year) after the well is constructed. On return to a well following suspension, the MODU reconnects to the well via the riser, and with BOP in place, barriers are removed and drilling and completions activity resumes.

### 3.8.9 Underwater Acoustic Positioning

An array of long base line (LBL) transponders may be installed on the seabed as required to support drilling activities. The LBL array provides accurate positioning by measuring ranges to three or more transponders deployed at known locations on the seabed and structures.

An array of transponders is proposed within a radius of 500 m from the proposed location of the wells and will be in place for a period of about three months per well. Transmissions are not continuous but consist of short ‘chirps’ with a duration that ranges from 3 to 40 milliseconds. Transponders will not emit any sound when on standby and are planned to only actively emit sound for about six hours per well. When required for general positioning, they will emit one chirp every five seconds (estimated to be required for four hours at a time). When required for precise positioning, they will emit one chirp every second (estimated to be required for two hours at a time).

During xmas tree installation activities ultra-short baseline transponders (USBL) may be installed on the seabed or mounted to the wellhead as required by the sub-sea installation activities. Transmissions from USBL transponders are similar to LBL transponders.

Transponders may be moored to the seabed either by a clump weight or mounted on a seabed frame. The standard clump weights used, made of cement or steel, will likely weigh about

80 kilogram (kg). A typical seabed frame is 1.5 m × 1.5 m × 1.5 m in dimension and weighs about 40 kg. On completion of the positioning operation, transponders and associated equipment will be removed.

### 3.8.10 Installation of Subsea Infrastructure

The subsea installation scope of work comprises the installation of subsea xmas trees. The dimensions of the xmas trees will be approximately 5 × 5 × 5 m (Length x Width x Height).

Prior to the upper completion being installed into the wells, the xmas trees will be installed from an installation vessel in SIMOPS with the MODU, or directly from the MODU. Due to the subsea well layout, if installation was to occur from the installation vessel, the MODU will be required to kedge off or reposition away from the drill centre to allow the installation vessel to install the xmas trees. The xmas trees will be suspended vertically approximately 10 m off the sea floor. Once the xmas trees have been installed, the connection to the wellhead will be pressure tested to confirm integrity. Once the MODU BOP is reconnected, a casing test will confirm integrity of xmas tree to allow continuation of drilling and completions activities.

The xmas trees will be installed with a preservation mixture in the production and annulus bores. There will be a small discharge of preservation fluid associated with testing and connection the subsea system (estimated 100 to 150 L per well).

### 3.8.11 Maintenance and Repair

Maintenance activities on subsea infrastructure are required at regular or planned intervals to prevent deterioration or integrity failure. Maintenance activities may include cycling and actuating valves, flushing chemical/hydraulic fluid lines, and leak and pressure testing.

Repair activities are required when a subsea system or component is degraded, damaged, or has deteriorated to a level outside acceptance limits. Damage sustained may not necessarily pose an immediate threat to continued system integrity, but presents an elevated level of risk to safety, environment, or production. Typical subsea repair activities include:

- xmas tree or component/cap repair and/or replacement
- corrosion protection.

Some environmental discharges are expected during subsea maintenance and repair activities. **Table 3-5** lists typical discharge volumes during different maintenance and repair activities.

**Table 3-5: Typical discharge volume during maintenance and repair activities**

| Activity | Typical Discharge |
|---|---|
| Pressure/leak testing | Chemical dye >10 L |
| Valve functioning | 0.5 L to 5 L per valve actuation |
| Flushing | Residual hydrocarbon or chemical releases volume depends on injection port size, component geometry, and pumping rates |
| Hot stab changeout | Hydrocarbons or control fluid <10 L. |
| Xmas tree repair, replacement, and recovery | Typical release of hydrocarbon or other chemicals depends on equipment configuration and flushing ability. This will be subject to an ALARP determination for the activity, as per normal practice. |

Excess marine growth may need to be removed before undertaking subsea IMR activities and/or following return to wells after a period of suspended drilling. An ROV is used for this activity; **Table 3-6** lists the different techniques used.

**Table 3-6: Marine growth removal**

| Activity/Equipment | Description |
|---|---|
| Water jetting | Uses high-pressure water to remove marine growth |
| Brush systems | Uses brushes attached to an ROV to physically remove marine growth |
| Acid | Chemically dissolves calcium deposits |

If sediment builds up around subsea infrastructure, an ROV-mounted suction pump/dredging unit may be used to move small amounts of sediment in the immediate vicinity of the subsea infrastructure (i.e. within the existing footprint) to allow inspection/intervention works to be undertaken. Sediment relocation typically results in minor seabed disturbance and some localised turbidity.

## 3.9 Project Vessels and Support Activities

### 3.9.1 MODU Operations

The Petroleum Activities Program will be drilled by a MODU. This is planned to be a DP MODU, with risks assessed in this EP for a moored MODU as a contingency. Typical specifications for these MODU types are provided in **Table 3-7** and **Table 3-8** respectively. These are collectively referred to as the MODU for the remainder of the document, unless specific risks for different MODU types have been identified. Due to variabilities, such as contractual and operational matters, the MODU used may be subject to change.

**Table 3-7: Typical DP MODU specifications (Valaris DPS-1)**

| Component | Specification Range |
|---|---|
| Rig type / Design / Class | Ultra deepwater semi-submersible MODU |
| Accommodation | 200 persons |
| Station keeping | Dynamically positioned |
| Bulk mud and cement storage capacity | 1000 $m^3$ |
| Liquid mud storage capacity | 2663 $m^3$ |
| Fuel oil storage capacity | 3640 $m^3$ |
| Drill water storage capacity | 3482 $m^3$ |

**Table 3-8: Typical moored MODU specification ranges (Ocean Apex)**

| Component | Specification Range |
|---|---|
| Rig type/design/class | Semi-submersible MODU |
| Accommodation | 120 to 200 personnel (maximum persons on board) |
| Station keeping | Minimum eight-point mooring system |
| Bulk mud and cement storage capacity | 283 to 770 $m^3$ |
| Liquid mud storage capacity | 576 to 2500 $m^3$ |
| Fuel oil storage capacity | 966 to 1400 $m^3$ |
| Drill water storage capacity | 3500 $m^3$ |

### 3.9.2 Vessel Operations

Vessels used during the Petroleum Activities Program include an installation vessel and subsea support vessels, with other vessels likely to be used to support MODU and vessel operations including general support vessel(s) and anchor handling vessel(s).

Vessels may mobilise from the nearest Australian port or directly from international waters to the Petroleum Activity Area (PAA), in accordance with biosecurity and marine assurance requirements.

All project vessels are subject to the Marine Offshore Vessel Assurance procedure which is detailed in Implementation **Section 7.7.2.3**.

### 3.9.2.1 Installation Vessel

The Petroleum Activities Program subsea installation scopes of work may require an installation vessel with enough capacity to accommodate hardware and equipment including the xmas trees.

A typical installation vessel would be a DP vessel (usually DP2 Class) equipped with a primary differential global surface positioning system (DGPS) and an independent secondary DGPS backup system. The specification of a typical subsea installation vessel is provided in **Table 3-9**.

Installation vessels are typically equipped with a variety of material handling equipment, which includes cranes, winches, ROVs and ROV Launch and Recovery Systems (LARS), Vertical Lay System (VLS) with either vertical reel drive or horizontal drive (carrousel) and pre-commissioning spread.

Lifting operations may involve loading and unloading of equipment from support and supply vessels onto the installation vessel and subsequently onto the seabed. Cranes are typically equipped with active heave compensation and auto tension modes and have lifting capacities in excess of expected lifting loads to be encountered during operations.

**Table 3-9: Typical DP 2 Class subsea installation vessel specifications for MMA Pinnacle**

| Component | Specification Range |
|---|---|
| Vessel Type | DP 2 Class as minimum |
| Crane Capacity | 150 T HMC |
| Deck Space | About 1000 $m^2$ |
| Deck Strength | About 10 $T/m^2$ |
| Accommodation | About 100 people |
| Fuel Oil | About 868 $m^3$ |
| Potable Water | About 586 $m^3$ |

### 3.9.2.2 Subsea Support Vessel

During the Petroleum Activities Program, a subsea support vessel for light well intervention (LWI) operations may be used as an option for contingent well intervention, subsea installation, subsea inspection maintenance and repair and other activities. Vessels supporting offshore activities may vary depending on requirements, vessel schedules, capability and availability.

Typical support vessels use a DP system to allow manoeuvrability and avoid anchoring when undertaking works. However, vessels are equipped with anchors which may be deployed in an emergency.

An example of this vessel type is the *Sapura Constructor*, which is a 117 m long subsea support vessel equipped with a saturation dive system, two work class remotely operated vehicles (ROV), well intervention equipment, a helideck, moon pool and accommodation for 120 personnel. The final vessel selection, if required, will be subject to commercial and operational considerations.

### 3.9.2.3 Support and Other Vessels

Support vessels are used to transport equipment and materials between the MODU/installation vessel and port (e.g. Dampier, Onslow, Exmouth). If required, one of the vessels may be present at the MODU to perform standby duties, and others will make regular trips between the PAA to port for routine, non-routine and emergency operations.

Anchor Handling Vessels (AHVs) may be required to set anchors and support the MODU and the installation vessel, during operations.

A variety of materials are routinely bulk transferred from support vessels to the MODU including drilling fluids (e.g. muds), base fluids, cements, and drill water. Cement, barite and bentonite are transported as dry bulk to the MODU by support vessels and pneumatically blown to the MODU storage tanks using compressed air. A range of dedicated bulk transfer stations and equipment are in place to accommodate the bulk transfer of each type of material. There is also a capacity to bulk transfer waste oil from the MODU to the support vessel, for back loading and disposal on shore.

The loading and back-loading of equipment, materials and wastes is one of the most common supporting activities conducted during drilling programs. Loading and back-loading is undertaken using cranes on the MODU to lift materials in appropriate offshore rated containers (e.g. ISO tanks, skip bins, containers) between the MODU and support vessel.

For power generation, vessels may use diesel-powered generators and/or LNG. All vessels will display navigational lighting and external lighting, as required for safe operations. Lighting levels will be determined primarily by operational safety and navigational requirements under relevant legislation, specifically the Navigation Act 2012. The MODU and support vessels will be lit to maintain operational safety on a 24-hour basis.

Standby duties may include but are not limited to periods of helicopter operations and working over the side activities while in the field.

Seawater is pumped on board and used as a heat exchange medium for the cooling of machinery engines and high temperature drilling fluid on the MODU. It is subsequently discharged from the MODU at the sea surface at potentially a higher temperature. Alternately, MODUs may use closed loop cooling systems.

Potable water, primarily for accommodation and associated domestic areas, may be generated on vessels using a reverse osmosis (RO) plant. This process will produce brine, which is diluted and discharged at the sea surface.

The MODU and support vessels will also discharge deck drainage from open drainage areas, bilge water from closed drainage areas, putrescible waste and treated sewage and grey water. Solid hazardous and non-hazardous wastes generated during the Petroleum Activities Program are disposed of onshore by support vessels, or may be incinerated where permissible.

Support vessels do not anchor within the PAA during the activities due to water depth; therefore, vessels will utilise DP.

The support vessels are also available to assist in implementation of the WA-61-L Scarborough Drilling and Completions Oil Pollution First Strike Plan (FSP), should an environmental incident occur (e.g. spills).

#### 3.9.2.4 Holding Station: Mooring Installation and Anchor Hold Testing/Soil Analysis

Mooring uses a system of chains/wires and anchors, which may be pre-laid before the MODU arrives at the location, to maintain position when drilling. A mooring analysis will be undertaken to determine the appropriate mooring system for the Petroleum Activities Program. The mooring analysis will identify whether the mooring system will be pre-laid or set by the MODU, define proof tension values, and evaluate whether synthetic fibre mooring ropes are required. A pre-laid system can generally withstand higher sea states compared to a system that only uses the MODUs mooring chain/equipment and can also save the time in establishing anchors.

Installation and proof tensioning of anchors involves some disturbance to the seabed. Anchor handling vessels (AHV) are used in the deployment and recovery of the mooring system.

As part of mooring preparations, anchor hold testing may be conducted at the development well locations. Anchor hold testing would be undertaken if Woodside determines that further assurance is required to ensure a robust mooring design.

Anchor hold testing may consist of an AHV or similar vessel dropping an anchor at a potential mooring location. The AHV would then tension the anchor to determine its ability to hold, embed and not drag at location. This may have to be repeated several times at each location. A ROV may also be utilised to judge how deep the anchor has embedded and independently verify the seabed condition. Anchor hold testing activities would occur prior to the MODU arriving on location.

Soil analysis may also be necessary to provide data on composition and rock/substrate strength as input into the mooring design and verify seabed conditions for anchor holding. Soil analysis could include taking a physical sample of the seabed using ROV or other tools or using measuring devices such as a cone penetrometer. These tests would be carried out up to several months prior to MODU arriving on location and may occur from a support vessel or anchor handling vessel.

Suction piling may be required as a contingent activity and will be reviewed with the MODU contractor.

#### 3.9.2.5 Holding Station: Dynamic Positioning (DP MODU and DP Vessels Only)

DP uses satellite navigation and radio transponders in conjunction with thrusters to maintain the position of the MODU or vessel at the required location. Information relating to the position of the MODU or vessel is provided via seabed transponders, which emit signals that are detected by receivers on the MODU or vessel and used to calculate position. The transponders are typically deployed in a pentagon array on the seabed, using steel clump weights, for the duration of the drilling at each development well. They are recovered at the end, generally by remotely operated vehicle (ROV).

#### 3.9.2.6 Refuelling

The MODU will be refuelled via support vessels approximately once a month or as required. Refuelling will take place within the PAA of the well being drilled at the time and has been included in the risk assessment for this EP. Other fuel transfers that may occur on board the MODU may include refuelling of cranes, helicopters or other equipment as required.

### 3.9.3 Helicopter Operations

During the Petroleum Activities Program, crew changes will be undertaken using helicopters as required. Helicopters are the primary means of transporting passengers and/or urgent freight to/from the activity. They are also the preferred means of evacuating personnel in an emergency.

Helicopter operations within the PAA are limited to helicopter take-off and landing on the helideck. Helicopters may be refuelled on the helideck.

### 3.9.4 ROV Operations

The MODU, installation vessel and support vessels may be equipped with a ROV system that is maintained and operated by a specialised contractor aboard the vessel. ROVs may be used during drilling operations and subsea installation, for activities such as:

- anchor holding testing
- pre-drill seabed and hazard survey
- transponder deployment
- blowout preventer (BOP) land-out and recovery
- BOP well control contingency
- visual observations at seabed during riserless drilling operation

- pre and post installation survey
- installation and testing of subsea infrastructure
- xmas tree operations.

An ROV can be fitted with various tools and camera systems that can be used to capture permanent records (both still images and video) of the operations and immediate surrounding environment. Specifically, during installation, the ROV will be fitted with hydraulically driven tools to facilitate flowline tie-in.

An ROV may also be used in the event of an incident for the deployment of the Subsea First Response Toolkit. This is discussed further in **Appendix D**.

## 3.10 Contingent Activities

The next sections present contingencies that may be required, if operational or technical issues occur during the Petroleum Activities Program. These contingencies have been considered within the relevant impact assessment sections and do not represent significant additional risks or impacts but may generate additional volumes of drilling fluids and cuttings being operationally discharged.

### 3.10.1 Contingency Development Wells

Two additional development wells may be installed under this EP. The wells would be installed as described in **Section 3.8** (Drilling Activities) and have not yet been located within WA-61-L.

### 3.10.2 Respud

A respud may be required for a number of reasons, such as if the conductor or well head slumps or fails installation criteria (typically during top hole drilling). Respudding involves moving the MODU to a suitably close location (e.g. about 25–50 m from the original location) to recommence drilling. A respud activity would result in repeating top-hole drilling (**Section 3.8.1.2**).

The environmental aspects of respudding are the same as those for drilling and are considered to be adequately addressed by this EP, with no significant changes to existing environmental risks or any additional environmental risks likely. The net environmental effect will be limited to an increase in the volume of cuttings generated (Table 6-8) and discharged at the seabed, from the repeat drilling of the top-hole section, plus an increase in the quantity of cement discharged at seabed from cementing the conductor and surface casing strings.

### 3.10.3 Workover

The proposed development wells may be worked over to monitor and maintain well integrity as required. A workover may be completed using either a MODU or LWI vessel. The environmental aspects of a workover operation are the same as those for undertaking well completion activities and are considered to be adequately addressed by this EP (**Section 6**), with no significant changes to existing environmental risks or any additional environmental risks likely.

### 3.10.4 Wireline Logging

Wireline contingencies that may be in place for development drilling include but are not limited to, Gamma Ray (GR) and Casing Collar Locator (CCL) for depth correlation, Ultrasonic Imaging Tool (USIT) and CBL to measure cement integrity, formation pressures (XPT), Density, Neutron and Resistivity and punch perforators/tubing cutters suitable for all tubing sizes. Wireline contingency work will be carried out with appropriate isolation barriers in place, i.e. an overbalanced fluid column. If wireline work is required to take place in a live well, or where there is a risk of barrier failure, then the operation will be carried out with full pressure control equipment at the surface.

Some logging tools may contain low activity radiation sources. Radiation fields are not generally detectable outside the tool when the tool is not energised, therefore they do not present an environmental risk.

### 3.10.5 Sidetrack

A sidetrack may be required instead of a respud if operational issues are encountered. The environmental aspects of a sidetrack well are the same as those for routine drilling activities, which are considered to be adequately addressed by this EP (**Section 6**), with no significant changes to existing environmental risks or any additional environmental risks likely. The net environmental effect will be limited to an increase in the volume of cuttings generated (**Table 6-8**), potential increase in the use of drilling fluids, and the additional emissions (atmospheric and waste) associated with an extended drilling program.

### 3.10.6 Well Intervention

An intervention may be carried out on any of the Petroleum Activities Program wells. Interventions may be carried out due to down-hole equipment failure or to address underperformance of a well.

Well intervention generally occurs within the wellbore and includes activities such as:

- slickline/wireline/coil-tubing operations
- well testing and flowback
- well workovers (mechanical or hydraulic).

Potential environmental impacts from intervention activities have been included in this EP, including discharge of suspension fluids and brines and small volume gas releases subsea due to removal of a tree cap which may be in place if the well was previously suspended.

During intervention activities, local control of the xmas tree may be required. Valve actuation of the trees may be required, which will result in small releases of subsea control fluids to be released to the environment. Intervention activities also include removing marine fouling by mechanical or acid soaking, resulting in the release of marine-fouling debris and small amounts of acid to the environment (refer to **Table 3-6**). When retrieving intervention tooling, small volumes of wellbore fluids may be displaced back into the well.

### 3.10.7 Well Abandonment

The Petroleum Activities Program covers the drilling of development wells, which are not envisaged to be abandoned until the end of the production field life. For technical reasons, it may be required to abandon the lower section of a well, prior to sidetracking, or in the event that a respud is required.

Well abandonment activities are conducted in accordance with Woodside's internal standards. Base oil may be used for inflow testing prior to abandonment, to verify barrier integrity (base oil is also used for well cleanup/well test activities and as such has been risk assessed in this EP). Base oil would be pumped down the drill string and reverse circulated back to the rig, with fluids collected for disposal onshore. If stored in a mud pit, the base oil and other fluids associated with the test may result in pit wash water contaminated with hydrocarbons. If this is the case, mud pit wash water would be discharged in accordance with requirements in this EP; with a hydrocarbon content <1% by volume.

If required, wells will be abandoned with abandonment cement plugs, including verification of the uppermost cement plug by tagging and/or pressure testing through a prescribed program. A lower section of a well may also be abandoned prior to sidetracking.

Following abandonment activity, the marine riser and BOP will be removed and every reasonable attempt for retrieval of the wellhead will be made. Wellheads are typically removed by deploying a cutting device on drill pipe which then cuts through the conductor, allowing the wellhead to be

retrieved to the surface. Another technique may use an ROV to activate the cutter. The conductor cutting equipment is usually reliable with a high success rate of cutting wellheads. Typically wellhead removal is successful after two attempts therefore this is considered reasonable. If these recognised removal techniques are ineffective after two attempts or technically the cut is deemed unfeasible after the first attempt (e.g. wellhead rotating, cutting BHA misalignment), the wellhead may be left in-situ (refer to **Section 3.10.8**).

### 3.10.8 Wellhead Assembly Left In-situ

If a well is abandoned due to the requirement to respud, the wellhead assembly may be left in-situ if recognised removal techniques are ineffective. Well abandonment activities would be undertaken as outlined in **Section 3.10.7**, but the wellhead assembly would remain. The integrity of the wellbore is not affected by the wellhead assembly remaining in-situ. The environmental aspects of the wellhead assembly remaining in-situ are considered to be adequately addressed by this EP (**Section 6**), with no significant changes to existing environmental risks or any additional environmental risks likely.

Final decommissioning of the development wellhead assembly and other subsea infrastructure at the end of field life will be subject to a separate EP.

### 3.10.9 Sediment Mobilisation and Relocation

If required, an ROV-mounted suction pump/dredging unit may be used to relocate sediment/cuttings around the wellhead or other infrastructure, to keep the area clear and safe for operations and equipment. This activity has the potential to generate plumes of suspended sediment during pumping and disturb benthic fauna in the immediate area.

### 3.10.10 Venting

During drilling of the well, a kick may occur. A kick is an undesirable influx of formation fluid into the wellbore. To maintain well integrity in this situation, a small volume of greenhouse gases is released to the atmosphere via the degasser, in a well control operation known as ‘venting’.

### 3.10.11 Emergency Disconnect Sequence

An Emergency Disconnect Sequence (EDS) may be implemented if the MODU is required to rapidly disengage from the well. The EDS closes the BOP (i.e. shutting in the well) and disconnects the riser to break the conduit between the wellhead/BOP and MODU. Common examples of when this system may be initiated include the movement of the MODU outside of its operating circle (e.g. due to a failure of one or more of the moorings or dynamic positioning system) or the movement of the MODU to avoid a vessel collision (e.g. third-party vessel on collision course with the MODU). EDS aims to leave the wellhead and BOP in a secure condition but will result in the loss of the drilling fluids/cuttings in the riser following disconnection.

# 4 DESCRIPTION OF THE EXISTING ENVIRONMENT

## 4.1 Overview

In accordance with Regulations 13(2) and 13(3) of the Environment Regulations, this section describes the existing environment that may be affected by the activity (planned and unplanned, as described in **Section 3**), including details of the particular relevant values and sensitivities of the environment, which were used for the risk assessment.

The Environment that May Be Affected (EMBA) is the largest spatial extent where unplanned events could have an environmental consequence on the surrounding environment. For this EP, the EMBA is the potential spatial extent of surface and in-water hydrocarbons at concentrations above ecological impact thresholds, in the event of the worst-case credible spill. The ecological impact thresholds used to delineate the EMBA are defined in **Section 6.8.1.3**. The worst-case credible spill scenario for this EP is loss of marine diesel during a vessel collision.

Woodside recognises that hydrocarbons may be visible beyond the EMBA at lower concentrations than the ecological impact thresholds defined in **Section 6.8.1.3**. These visible hydrocarbons are not expected to cause ecological impacts. In respect of this, an additional socio-cultural EMBA is defined, as the potential spatial extent within which social-cultural impacts may occur from changes to the visual amenity of the marine environment. Receptors relevant to the socio-cultural EMBA include Commonwealth and State marine protected areas (MPAs), National and Commonwealth Heritage Listed places, areas of tourism and recreation, and commercial and traditional fisheries. For this EP, the socio-cultural EMBA for surface hydrocarbons encompasses an area fully within the boundaries of the EMBA for ecological impacts. The EMBA and socio-economic EMBA are shown in **Figure 4-1** and described in **Table 4-1**.

The EMBA presented does not represent the predicted coverage of any one hydrocarbon spill or a depiction of a slick or plume at any particular point in time. Rather, the areas are a composite of a large number of theoretical paths, integrated over the full duration of the simulations under various metocean conditions.

**Table 4-1: Hydrocarbon spill thresholds used to define EMBA for surface and in-water hydrocarbons**

| Hydrocarbon Type | EMBA[1] | Socio-cultural EMBA[1] | Planning Area for Scientific Monitoring |
|---|---|---|---|
| Surface | 10 g/m$^2$<br>This represents the minimum oil thickness (0.01 mm) at which ecological impacts (e.g. to birds and marine mammals) are expected to occur. | 1 g/m$^2$<br>This represents a wider area where a visible sheen may be present on the surface and, therefore, the concentration at which socio-cultural impacts to the visual amenity of the marine environment may occur. However, it is below concentrations at which ecological impacts are expected to occur. | NA |
| Dissolved | 50 ppb<br>This represents potential toxic effects, particularly sublethal effects to highly sensitive species (NOPSEMA guidance note: A652993, April 2019). As dissolved hydrocarbons are within the water column and not visible, impacts to socio-cultural receptors are associated with ecological impacts. Therefore, dissolved hydrocarbons at this threshold also represent the level at which socio-cultural impacts may occur. | | 10 ppb<br>This low exposure value establishes the planning area for scientific monitoring (based on potential for exceedance of water quality triggers) (NOPSEMA guidance note: A652993, April 2019). This area is described further in **Appendix D: Figure 5-1**. |
| Entrained | 100 ppb<br>This represents potential toxic effects, particularly sublethal effects to highly sensitive species (NOPSEMA guidance note: | | |

| Hydrocarbon Type | EMBA[1] | Socio-cultural EMBA[1] | Planning Area for Scientific Monitoring |
|---|---|---|---|
| | A652993, April 2019). As entrained hydrocarbons are within the water column and not visible, impacts to socio-cultural receptors are associated with ecological impacts. Therefore, entrained hydrocarbons at this threshold also represent the level at which socio-cultural impacts may occur. | | |
| Shoreline | 100 g/m$^2$<br>This represents the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat. | 10 g/m$^2$<br>This represents the volume where hydrocarbons may be visible on the shoreline but is below concentrations at which ecological impacts are expected to occur. | N/A |

[1] *Further details including the source of the thresholds used to define the EMBA in this table are provided in* ***Section 6.8.1.3***

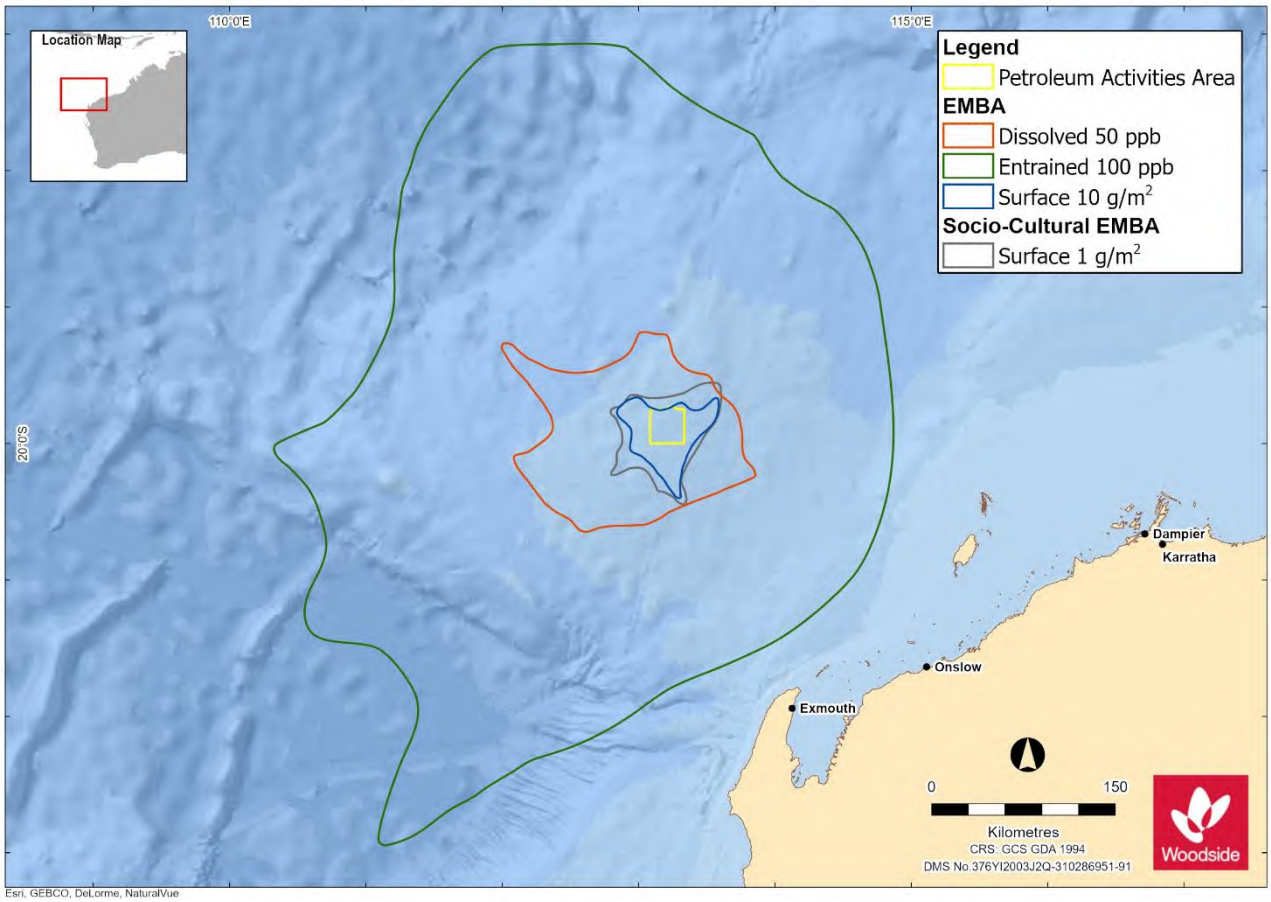



**Figure 4-1: Environment that May Be Affected by the Petroleum Activities Program**

## 4.2 Regional Context

The PAA occurs in Commonwealth waters off the north-west coast of Western Australia (WA), located in the North-west Marine Bioregion (NWMR) (IMCRA 4.0). Within the NWMR, the PAA lies within the Northern Carnarvon Basin on the Exmouth Plateau, about 374 km offshore from Dampier. The PAA overlaps with the Northwest Province and the EMBA partially overlaps with the Central Western Transition (**Figure 4-2**). Woodside's Description of Existing Environment (**Appendix I**) summarises the characteristics for the relevant marine bioregions.

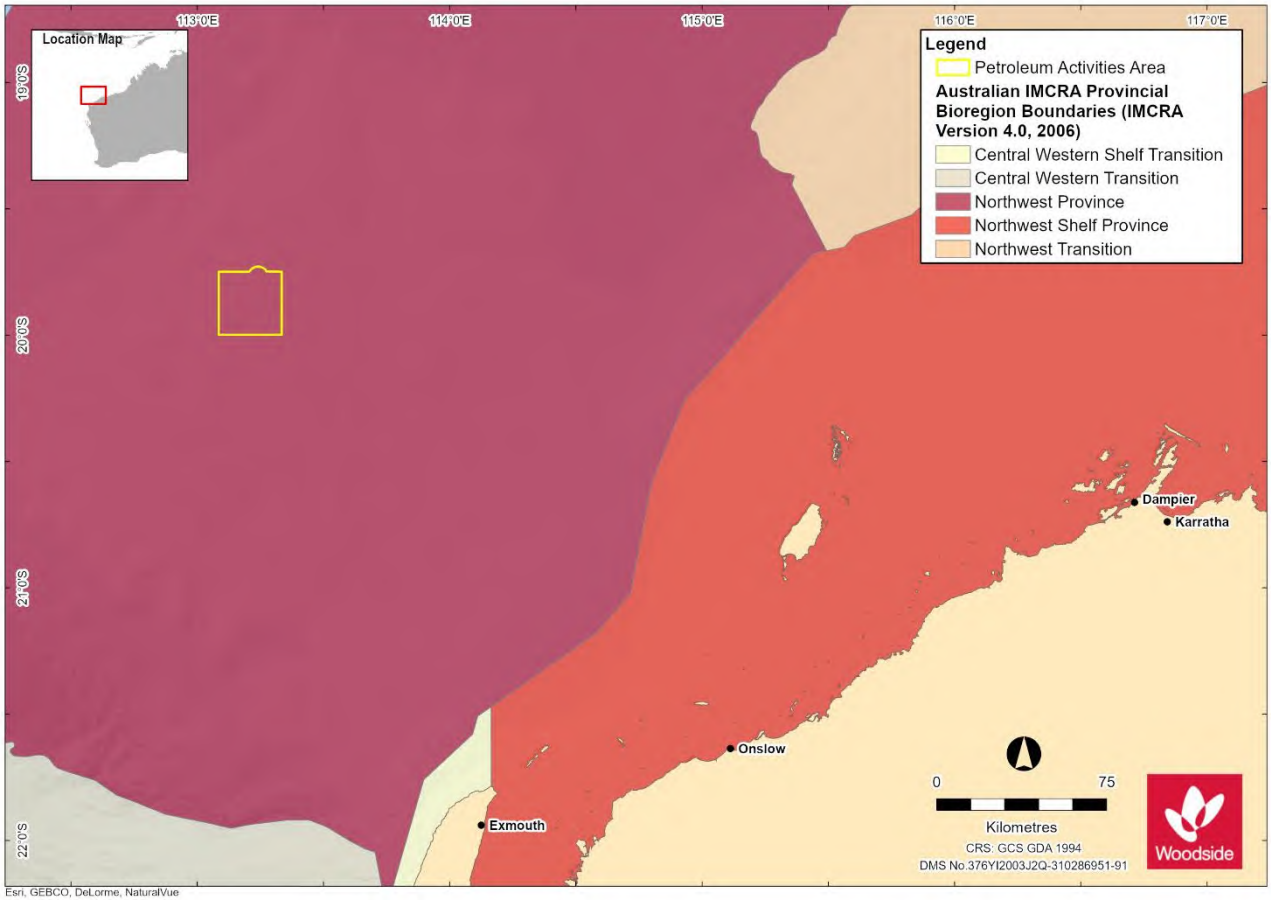



**Figure 4-2: Location of the PAA and relevant marine bioregions**

## 4.3 Matters of National Environmental Significance (EPBC Act)

**Table 4-2** and **Table 4-3** summarise the matters of national environmental significance (MNES) overlapping the PAA and EMBA, respectively, according to Protected Matters Search Tool (PMST) results (**Appendix C**). It should be noted that the EPBC Act PMST is a general database that conservatively identifies areas in which protected species have the potential to occur.

Additional information on these MNES are provided in subsequent sections of this chapter and described in detail in **Appendix I**.

**Table 4-2: Summary of MNES identified by the EPBC Act Protected Matters Search Tool (PMST) as potentially occurring within the PAA**

| MNES | Number | Relevant Section |
|---|---|---|
| World Heritage Properties | 0 | **Section 4.9.2** |
| National Heritage Places | 0 | **Section 4.9.2** |
| Wetlands of International Importance (Ramsar) | 0 | **Section 4.9.2** |
| Commonwealth Marine Area | 1 | **Section 4.2** |
| Listed Threatened Ecological Communities | 0 | **Section 4.5** |
| Listed Threatened Species | 23 | **Section 4.6** |
| Listed Migratory Species | 23 | **Section 4.6** |

**Table 4-3: Summary of MNES identified by the EPBC Act PMST as potentially occurring within the EMBA**

| MNES | Number | Relevant Section |
|---|---|---|
| World Heritage Properties | 0 | **Section 4.9.2** |
| National Heritage Places | 0 | **Section 4.9.2** |
| Wetlands of International Importance (Ramsar) | 0 | **Section 4.9.2** |
| Commonwealth Marine Area | 2 | **Section 4.2** |
| Listed Threatened Ecological Communities | 0 | **Section 4.5** |
| Listed Threatened Species | 27 | **Section 4.6** |
| Listed Migratory Species | 43 | **Section 4.6** |

## 4.4 Physical Environment

Water depths of the PAA range from 900–955 m. The shallowest waters are approximately in the centre of the PAA, with a gradual increase in depth to the north/north-west and also to the south/south-east (**Figure 4-3**). To the centre and west of the PAA, craters (up to 400 m across and 10 m deep) and similar pockmarks (metres to tens of metres across) have been identified through geophysical surveys (Fugro, 2010). The seafloor exhibits gradients less than 1$^{o}$ but extends to about 15$^{o}$ on the edge of craters (Fugro, 2010). These crater and pockmark formations may be associated with hydrocarbon seeps and associated authigenic carbonate formations (Fugro, 2010).

Marine sediment quality surveys within the Scarborough (WA-61-L[2]) title were undertaken during the 2012/2013 wet and dry seasons (ERM, 2013a). The ERM marine investigation included sampling at a number of sampling sites, to:

- provide a broad characterisation of the habitats within WA-61-L
- achieve spatial coverage across WA-61-L
- provide a representative selection of the various topographic features and corresponding benthic habitats (i.e. crater/pockmark versus non-crater areas).

Key results included:

- All the sediment samples collected were predominantly (≥97% w/w) composed of clay and silt; and only small amounts (1–3% w/w) of sand and shell were detected.
- Generally, low concentrations of metals and nutrients were detected. With the exception of nickel, metal concentrations were below the sediment default guideline values (DGVs)

[2] Note that the WA-1-R title expired on 1/11/2020, and was replaced by WA-61-L.

(Simpson, 2013) for analytes with defined DGVs (arsenic, cadmium, chromium, copper, mercury, nickel, lead and zinc). Nickel concentrations were below the high GV.

- No hydrocarbons were detected.

Although crater and pockmark formations have been identified in the EMBA, which have been associated with hydrocarbon seeps and authigenic carbonate formations (Fugro, 2010), the absence of hydrocarbons in sediment samples indicates the lack of recent hydrocarbon seep activity in the locations sampled (ERM, 2013).

Water quality in the PAA is typical of an tropical offshore environment. Much of the surface water in this area is nutrient poor, transported from the Indonesian Throughflow (ITF) and has low primary productivity.

The marine water quality of the offshore environment of the Exmouth Plateau was measured by collecting triplicate water samples at three stations per 15 sampling sites (across two seasons) (ERM, 2013a). Water profiling and water quality sampling was undertaken in the 2012/2013 wet and dry seasons. The main findings include:

- The deeper waters had significantly lower dissolved oxygen concentrations (about 23%) compared to the oxygen-saturated (≥100%) surface waters.
- Generally low concentrations of metals, nutrients and chlorophyll-a were detected. With the exception of cobalt, copper and zinc, mean metal concentrations throughout WA-61-L during both the wet and dry season studies were below the ANZECC guidelines trigger value for 95% species protection (ANZECC and ARMCANZ 2000).
- Total suspended solid mean concentrations were higher during the wet season (22,450 µg/L) than the dry season study (4000 µg/L) and showed variability across sites and throughout the water column.
- No hydrocarbons were detected.

Results from the studies indicated that the water quality within the WA-61-L title is generally typical of the NWMR's tropical deep-water environment (ERM, 2013a).

**Appendix I** provides a summary of the physical characteristics of the environment within the EMBA.

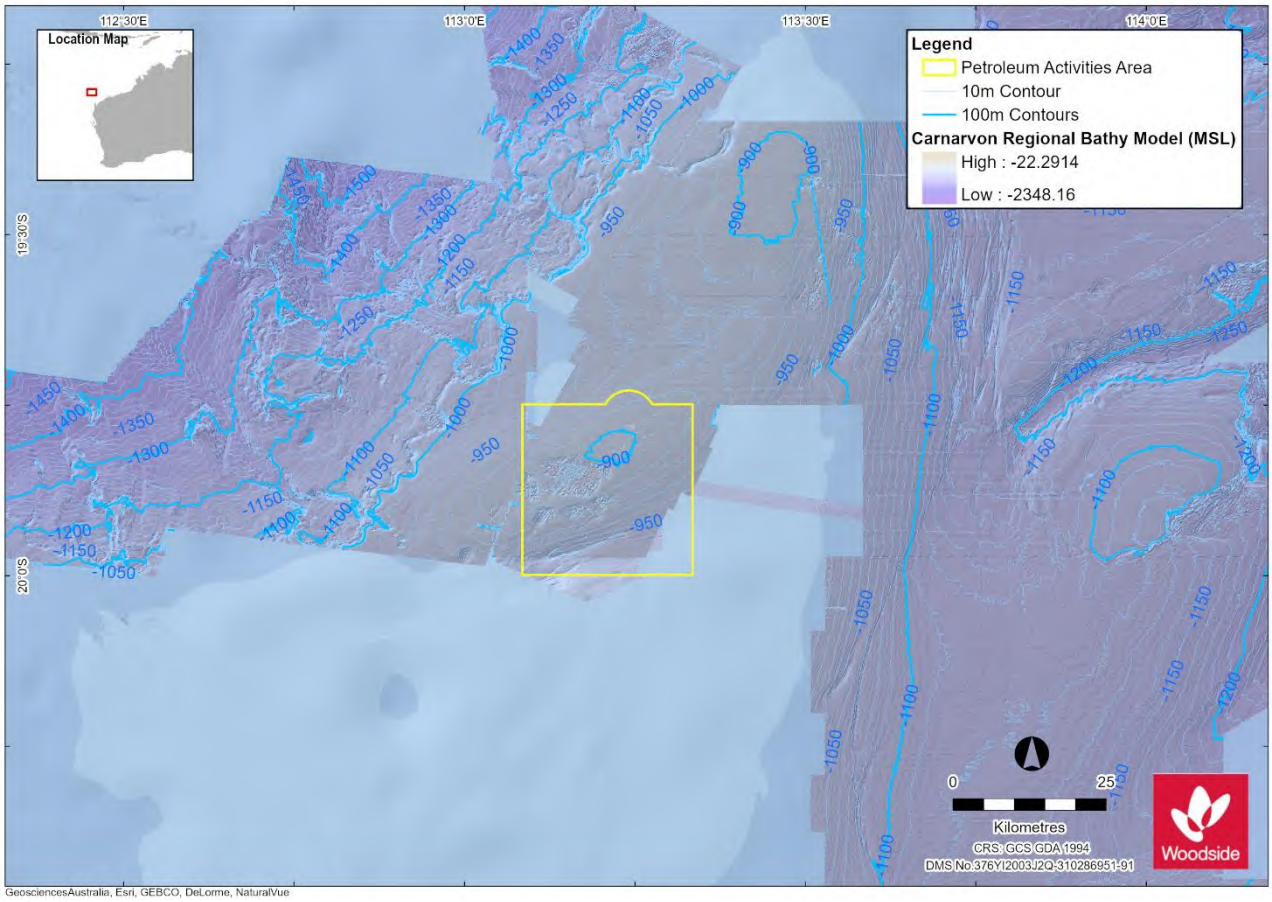



**Figure 4-3: Bathymetry of the PAA**

## 4.5 Habitats and Biological Communities

The seafloor in the PAA is characterised by sparse marine life dominated by motile organisms (ERM, 2013a). This soft bottom habitat also supports patchy distributions of mobile epibenthos, such as sea cucumbers, ophiuroids, echinoderms, polychaetes and sea-pens (DEWHA, 2008). Bivalve shell debris and bacterial mats (both with low percent cover) were the only identified features that may be indicative of historic hydrocarbon seep activity. A benthic infauna analysis reported by ERM in 2013 provided no evidence of the presence of unique hydrocarbon seep chemosynthetic benthic communities, which are typically characterised by species from the family Dorvilleidae (ERM, 2013a; Thornhill et al., 2012).

Seabed habitat is characterised by sparse marine life dominated by mobile benthic biota (ERM, 2013a). The benthic biota are predominately deposit feeders such as epifauna (living on the seabed): shrimp (crustaceans) and sea cucumbers (echinoderms), and infauna (living within the surface sediments) small, burrowing worms (polychaetes) and crustaceans (ERM, 2013). Bioturbation traces (seabed surface sediment animals trails, mounds and burrows) are characteristic of such deepwater benthic habitats and were recorded during baseline survey work (ERM, 2013) and are thought to be common within the PAA and EMBA. The seabed bioturbation indicates the presence of benthic biota (epifauna and infauna) including echinoderms, crustaceans and echiurans (spoon worms) and annelids (polychaetes) (ERM, 2013a).

Sampling within the Permit Area returned low phytoplankton densities (ERM, 2013a). Seasonal variation was observed in the samples with total recorded taxa, species richness and species diversity (Shannon-Weiner) being significantly greater in the dry season than in the wet season (ERM, 2013). Dinoflagellates were the most abundant group within wet season study, and diatoms were generally the most abundant group in dry season study (ERM, 2013a).

Similarly, greater species abundance and diversity was recorded in zooplankton samples during the dry season compared to the wet season (ERM, 2013a). Copepods were the most dominant taxonomic group during both studies in terms of abundance and concentrations, with other zooplankton including ostracods, molluscs (pteropods), euphausiids (krill) and larvaceans also being identified in relatively abundant amounts (ERM, 2013a).

Concentrations of fish larvae were similar in both wet and dry season samples. For both seasons ichthyoplankton communities largely comprised the larvae of meso-pelagic fishes (Myctophidae [lantern fishes] and Gonostomatidae [bristlemouths]) (ERM, 2013a).

It is noted that these survey findings do not reflect the productivity trends reported in scientific literature for the region (DEWHA, 2008; Brewer et al., 2007), whereby productivity is typically greater during the wet season when the weakening of surface currents allows for increased upwelling. However, the findings do indicate that productivity remains low across the seasons and that while seasonal variations in plankton species composition potentially occurs, overall variations in abundance are likely to be minor (ERM, 2013a).

Key habitats and ecological communities within the EMBA are identified in **Table 4-4** and described in **Appendix I**.

**Table 4-4: Habitats and communities within the EMBA**

| Habitat/community | Key locations within the EMBA |
|---|---|
| ***Marine primary producers*** | |
| Coral | No hard coral habitats likely to occur within the EMBA. |
| Seagrass beds and macroalgae | No seagrass beds or macroalgae habitats occur within the EMBA. |
| Mangroves | No mangrove habitats occur within the EMBA. |
| ***Other communities and habitats*** | |
| Plankton | Plankton communities within the EMBA are expected to reflect the distribution and abundance of the NWMR. |
| Pelagic and demersal fish populations | Fish populations within the EMBA are expected to reflect the distribution and abundance of the NWMR. |
| Epifauna and infauna | Epifauna and infauna within the EMBA are expected to reflect the distribution and abundance of the NWMR. |

## 4.6 Protected Species

A total of 40 EPBC Act listed species considered to be MNES were identified as potentially occurring within the EMBA, of which a subset of 29 species were identified as potentially occurring within the PAA. The full list of marine species identified from the PMST reports is provided in **Appendix C**, including several MNES that are not considered to be credibly impacted (e.g. terrestrial species within the EMBA). Two conservation dependent species have also been identified with a potential to occur within the PAA and / or EMBA. One of those species, southern bluefin tuna, has a spawning area within the South of Java Island Ecologically or Biologically Significant Marine Areas (EBSA) directly to the north of the PAA (Figure 4-4).

Species identified as potentially occurring within the PAA and EMBA and Biologically Important Areas (BIAs) or Habitat Critical to their Survival (Habitat Critical) that overlap the PAA and EMBA are listed in Table 4-5 to Table 4-10, and a description of species is included in **Appendix I**. Figure 4-5 and Figure 4-8 show the spatial overlap with relevant BIAs and Habitat Critical areas and the PAA.

### 4.6.1 Fish, Sharks and Rays

**Table 4-5: Threatened and Migratory fish, shark and ray species predicted to occur within the PAA and EMBA**

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| *Carcharodon carcharias* | White shark, great white shark | Vulnerable | Migratory | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Carcharhinus longimanus* | Oceanic whitetip shark | NA | Migratory | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Isurus oxyrinchus* | Shortfin mako, mako shark | N/A | Migratory | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Isurus paucus* | Longfin mako shark | N/A | Migratory | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Manta birostris* (recently revised taxonomy *Mobula birostris* [White et al., 2017]) | Giant manta ray, chevron manta ray, Pacific manta ray, pelagic manta ray, oceanic manta ray | N/A | Migratory | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Manta alfredi* | Reef manta ray | N/A | Migratory | N/A | Species or species habitat likely to occur within area |
| *Anoxypristis cuspidata* | Narrow Sawfish | N/A | Migratory | N/A | Species or species habitat may occur within area |
| *Carcharias taurus* | Grey nurse shark | Vulnerable | N/A | N/A | Species or species habitat known to occur |
| *Lamna nasus* | Porbeagle Shark/ Mackerel Shark | NA | Migratory | NA | Species or species habitat may occur within area |

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| *Pristis clavate* | Dwarf sawfish | Vulnerable | Migratory | N/A | Species or species habitat known to occur |
| *Pristis pristis* | Freshwater sawfish | Vulnerable | Migratory | N/A | Species or species habitat likely to occur |
| *Pristis zijsron* | Green sawfish | Vulnerable | Migratory | NA | Species or species habitat known to occur within area |
| *Rhincodon typus* | Whale shark | Vulnerable | Migratory | N/A | Foraging, feeding or related behaviour known to occur |
| *Thunnus maccoyii* | Southern bluefin tuna | Conservation Dependent | N/A | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Sphyrna lewini* | Scalloped hammerhead shark | Conservation Dependent | N/A | Species or species habitat likely may occur within area | Species or species habitat likely to occur within area |

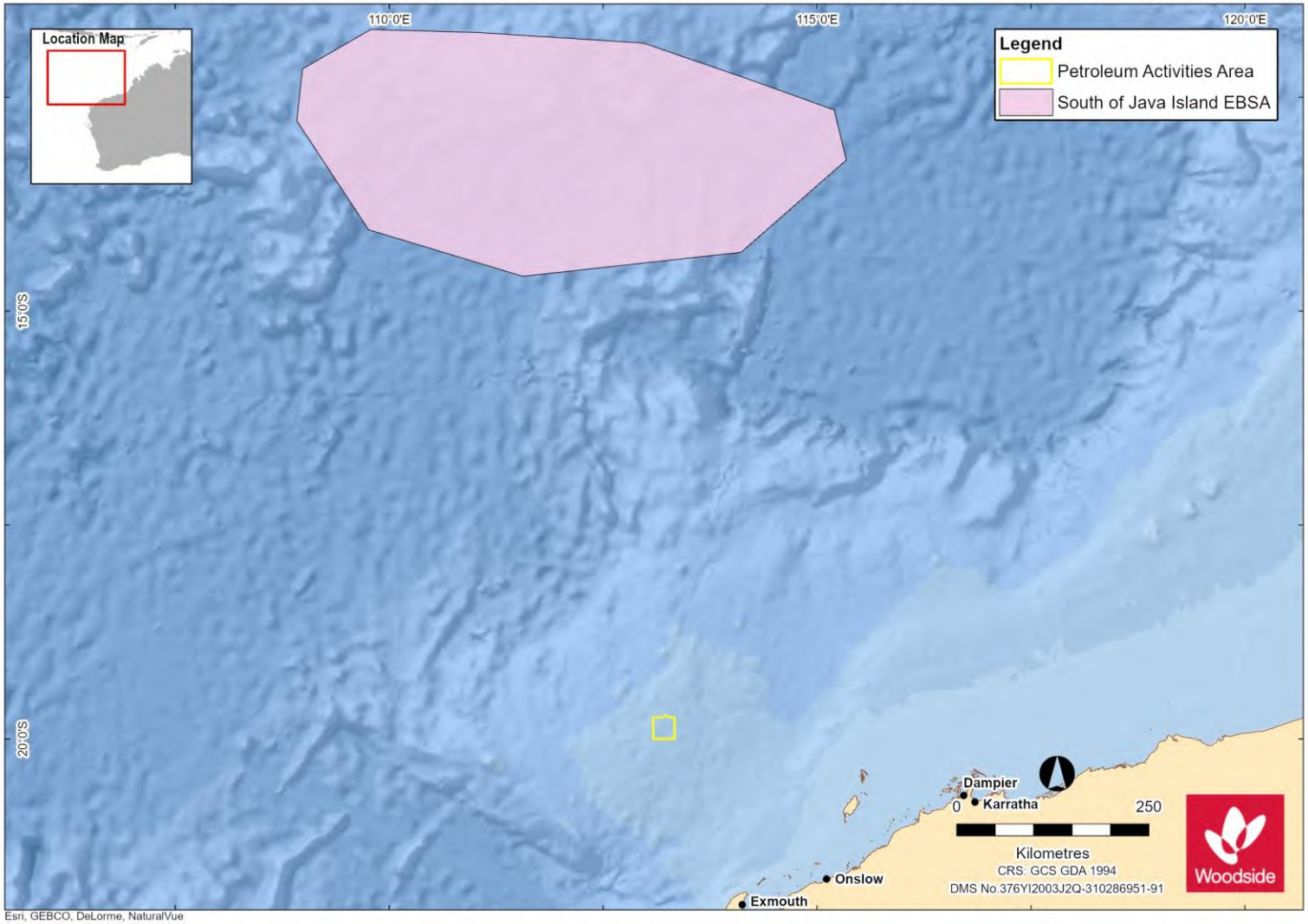



**Figure 4-4: Southern bluefin tuna spawning area – South of Java Island EBSA[1]**

[1] *EBSA – Ecologically or Biologically Significant Marine Areas; https://www.cbd.int/ebsa/*

### 4.6.2 Marine Reptiles

**Table 4-6: Threatened and Migratory marine reptile species predicted to occur within the PAA and EMBA**

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| *Caretta caretta* | Loggerhead turtle | Endangered | Migratory | Species or species habitat likely to occur within area | Species or species habitat known to occur within area |
| *Dermochelys coriacea* | Leatherback turtle, leathery turtle, luth | Endangered | Migratory | Species or species habitat likely to occur within area | Species or species habitat known to occur within area |
| *Chelonia mydas* | Green turtle | Vulnerable | Migratory | Species or species habitat likely to occur within area | Species or species habitat known to occur within area] |
| *Eretmochelys imbricata* | Hawksbill turtle | Vulnerable | Migratory | Species or species habitat likely to occur within area | Species or species habitat known to occur within area |
| *Natator depressus* | Flatback turtle | Vulnerable | Migratory | Species or species habitat likely to occur within area | Congregation or aggregation known to occur |

### 4.6.3 Marine Mammals

**Table 4-7: Threatened and Migratory marine mammal species predicted to occur within the PAA and EMBA**

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| *Balaenoptera musculus* | Blue whale (true/Antarctic) | Endangered | Migratory | Species or species habitat likely to occur within area | Migration route known to occur within area |
| *Balaenoptera musculus brevicauda** | Pygmy blue whale | Endangered | Migratory | Species or species habitat likely to occur within area | Migration route known to occur within area |

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| *Balaenoptera borealis* | Sei whale | Vulnerable | Migratory | Species or species habitat likely to occur within area | Foraging, feeding or related behaviour likely to occur |
| *Balaenoptera physalus* | Fin whale | Vulnerable | Migratory | Species or species habitat likely to occur within area | Foraging, feeding or related behaviour likely to occur |
| *Megaptera novaeangliae* | Humpback whale | N/A | Migratory | Species or species habitat may occur within area | Species or species habitat known to occur within area |
| *Balaenoptera edeni* | Bryde's whale | N/A | Migratory | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Physeter macrocephalus* | Sperm whale | N/A | Migratory | Species or species habitat likely to occur within area | Species or species habitat may occur within area |
| *Balaenoptera bonaerensis* | Antarctic minke whale, Dark-shoulder minke whale | N/A | Migratory | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area |
| *Orcinus orca* | Killer whale, orca | N/A | Migratory | Species or species habitat may occur within area | Species or species habitat may occur within area |
| *Eubalaena australis* | Southern right whale | Endangered | Migratory | N/A | Species or species habitat may occur within area |
| *Tursiops aduncus* | Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) | N/A | Migratory | N/A | Species or species habitat may occur within area |

**Species not detected in PMST search but reported to occur in the area (McCauley, 2011b).*

*Note: Dolphins of unconfirmed species (potentially Risso's or spinner dolphins) also present in the area (McCauley, 2011b)*

**Table 4-8: Marine mammal BIAs within the EMBA**

| Species | BIA type | Approximate distance (km) and direction from PAA |
|---|---|---|
| *Balaenoptera musculus brevicauda* (Pygmy blue whale) | Migration pathway extending from Perth Canyon to Indonesia | 37 km south-east |

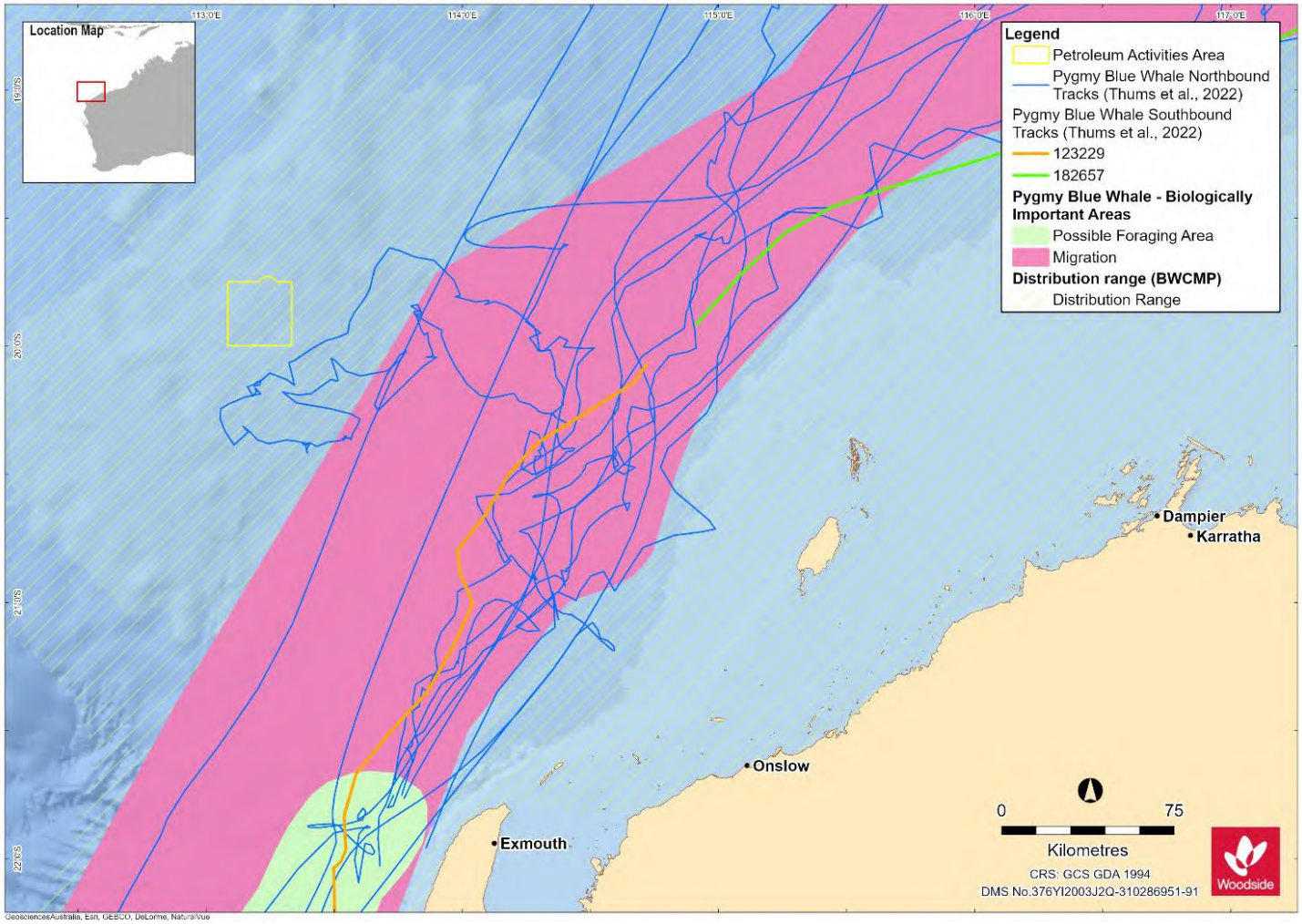



**Figure 4-5: Pygmy blue whale BIAs and distribution range (as per the NCVA and Blue Whale Conservation Management Plan (BWCMP), respectively) with reference to the PAA and the 20 tracks of satellite tagged pygmy blue whales recorded in the NWMR, of the 22 tracks presented in Thums et al. (2022).**

### Pygmy Blue Whales

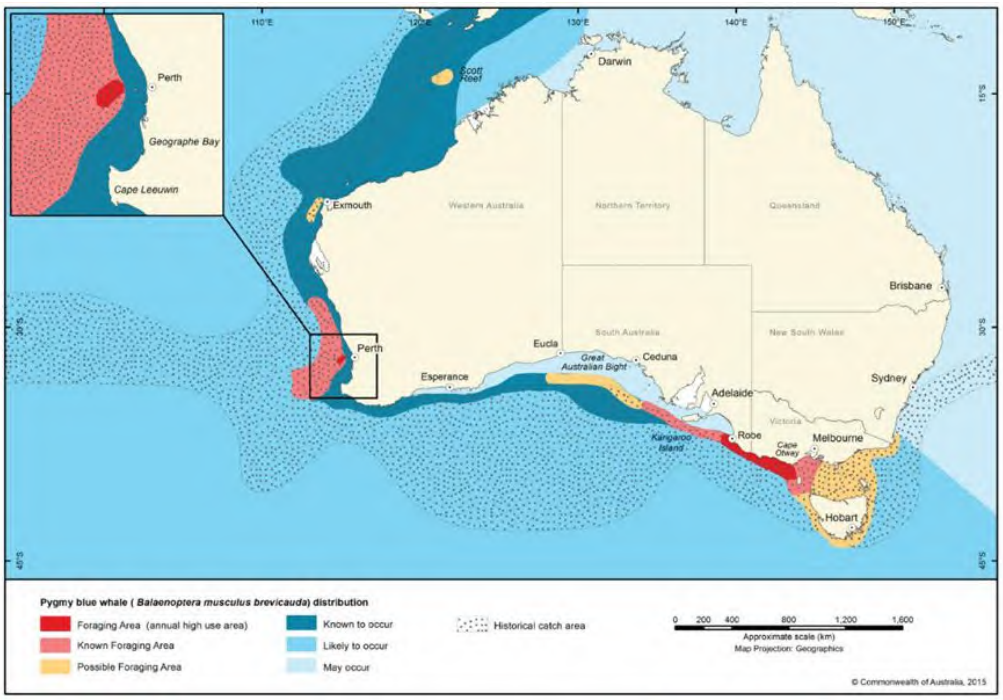
The blue whale (Balaenoptera musculus) is currently listed as Endangered, Migratory and Cetacean under the EPBC Act and Endangered under the WA Biodiversity Conservation Act 2016 (BC Act, September 2018).

The important biological habitats for critical life stages of the pygmy blue whale life cycle are presented in the Blue Whale Conservation Management Plan (CMP) (CoA, 2015a) and the National Conservation Values Atlas (NCVA). The PAA is located ~35 km west of the western edge of the migration BIA (Figure 4-5) and overlaps the broader pygmy blue whale distribution (Figure 4-6).

The pygmy blue whale distribution range is a spatially defined area where pygmy blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections (Commonwealth of Australia, 2015). Thums et al. (2022) acknowledged that the majority of important migration areas for north-west Australia were encompassed by the pygmy blue whale migration BIA, as shown by 20 tracks for northbound pygmy blue whale, as presented in Figure 4-5. Furthermore, the analysis identified areas off from Ningaloo Reef to the Rowley Shoals as important for foraging (and/or breeding/resting) using the overlay of three modelled metrics (occupancy, number of whales and move persistence) by Thums et al. (2022). These include areas within and to the west of the migration BIA. The possibility that some migrating pygmy blue whales could be opportunistically foraging to the west of the migration BIA is supported by the track of one northbound individual tagged off the North West Cape in early June 2020. This tagged whale spent about 486 hours (20 days) in what appeared to be opportunistic foraging movement behaviour (Thums et al. 2022; AIMS, 2022), over an area that included time in the southern area of the Exmouth Plateau and within the migration BIA, refer to Figure 4-5. The area the whales have been shown to fan out and migrate beyond the BIA (Thums et al. (2022) is north of the PAA. Two southbound tracked whales also travelled predominantly within the migration BIA (refer to Figure 4-5).

Considering the proximity of the pygmy blue whale migration BIA to the PAA (~35 km), as well as the recorded presence of an individual, within the distribution range (~5km from the PAA), it is possible that individuals may transit in and around the PAA during migratory periods. However, only transient individuals or small groups are expected occasionally during the north and south bound migratory seasons (April to July and October to January, respectively) (McCauley, 2011, Gavrilov et al. 2018; Thums et al., 2022).

The Exmouth Plateau KEF (refer to **Section 4.7**) is an area of localised upwelling and may be a source of food for occasional pygmy blue whale foraging. Migrating pygmy blue whales display predominantly relatively fast, directed travel (mean travel rate 2.8±0.8 km $hr^{-1}$) during the northbound peak period of May and June. This is indicating limited foraging behaviour; however it is interspersed with relatively short periods of slower speeds which may be indicative of opportunistic foraging (Thums et al., 2022). By contrast, acoustic detection (McCauley, 2011) suggests that whales are travelling faster during the southbound migration than during the northbound migration. Thums et al. (2022) also noted the rate of southbound travel was faster than on the northern migration (based on the tracks of two whales). However, short periods of putative foraging was noted for one whale.




| | |
|---|---|
| Foraging Area (Annual high use area) | Blue whales are regularly observed feeding on a seasonal basis |
| Known Foraging Area | Known foraging occurs in these areas but is highly variable both between and within seasons |
| Possible Foraging Area | Evidence for feeding is based on limited direct observations or through indirect evidence, such as occurrence of krill in close proximity of whales, or satellite tagged whales showing circling tracks. Blue whales travel through on a seasonal basis, possibly as part of their migratory route |

| | |
|---|---|
| Known to occur | Blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections |
| Likely to occur | Blue whales are likely to occur based on occasional observations in the area and nearby areas |
| May occur | Evidence for the presence of blue whales through strandings or rare observations |
| Historical catch area | Blue whales were caught during the whaling period based on whaling data |

**Figure 4-6: Important foraging and areas of occurrence for pygmy blue whales as presented in the Blue Whale Conservation Management Plan (Commonwealth of Australia, 2015). Note: Known to occur area in the BWCMP is the same as the distribution range presented in the National Conservation Values Atlas.**

### 4.6.4 Seabirds and Migratory Shorebirds

**Table 4-9: Threatened and Migratory seabird and shorebird species predicted to occur within the PAA and EMBA**

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| *Actitis hypoleucos* | Common sandpiper | N/A | Migratory | Species or species habitat may to occur within area | Species or species habitat may to occur within area |
| *Anous stolidus* | Common noddy | N/A | Migratory | Species or species habitat may to occur within area | Species or species habitat may occur within area |
| *Calidris acuminata* | Sharp-tailed sandpiper | N/A | Migratory | Species or species habitat may to occur within area | Species or species habitat may to occur within area |
| *Calidris canutus* | Red knot, knot | Endangered | Migratory | Species or species habitat may to occur within area | Species or species habitat may to occur within area |
| *Calidris melanotos* | Pectoral sandpiper | N/A | Migratory | Species or species habitat may to occur within area | Species or species habitat may to occur within area |
| *Fregata ariel* | Lesser frigatebird, least frigatebird | N/A | Migratory | Species or species habitat may to occur within area | Species or species habitat likely to occur within area |
| *Macronectes giganteus* | Southern giant-petrel, southern giant petrel | Endangered | Migratory | Species or species habitat may occur within area | Species or species habitat may occur within area |
| *Phaethon lepturus fulvus* | Christmas Island White-tailed Tropicbird | Endangered | NA | Species or species habitat may occur within area | Species or species habitat may occur within area |
| *Phaethon lepturus* | White-tailed Tropicbird | N/A | Migratory | Species or species habitat may occur within area | Species or species habitat may occur within area |

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| *Ardenna pacifica* | Wedge-tailed shearwater | NA | Migratory | NA | Foraging, feeding or related behaviour likely to occur within area |
| *Ardenna carneipes* | Flesh-footed Shearwater | NA | Migratory | NA | Species or species habitat may occur within area |
| *Calidris ferruginea* | Curlew sandpiper | Critically Endangered | N/A | N/A | Species or species habitat may occur within area |
| *Calonectris leucomelas* | Streaked Shearwater | NA | Migratory | NA | Species or species habitat likely to occur within area |
| *Fregata minor* | Great frigatebird, greater frigatebird | N/A | Migratory | N/A | Species or species habitat may occur within area |
| *Numenius madagascariensis* | Eastern curlew | Critically Endangered | | N/A | Species or species habitat may occur within area |
| *Pandion haliateus* | Osprey | N/A | Migratory | N/A | Species or species habitat known to occur |
| *Papasula abbotti* | Abbott's booby | Endangered | N/A | N/A | Species or species habitat may occur |
| *Pterodroma mollis* | Soft-plumaged petrel | Vulnerable | N/A | N/A | Foraging, feeding or related behaviour likely to occur within area |
| Sternula nereis nereis | Australian fairy tern | Vulnerable | N/A | N/A | Foraging, feeding or related behaviour likely to occur |

| Species name | Common name | Threatened status | Migratory status | Potential for interaction | |
|---|---|---|---|---|---|
| | | | | ***PAA*** | ***EMBA*** |
| Thalassarche carteri | Indian yellow-nosed albatross | Vulnerable | Migratory | N/A | Species or species habitat may occur |
| *Thalassarche impavida* | Campbell Albatross, | Vulnerable | Migratory | NA | Species or species habitat may occur within area |

**Table 4-10: Seabird BIAs within the EMBA**

| Species | BIA type | Approximate distance (km) and direction from PAA |
|---|---|---|
| *Ardenna pacifica* (Wedge-tailed shearwater) | Breeding and foraging (Pilbara coast) | 115 km south-east |

### 4.6.5 Seasonal Sensitivities for Protected Species

Seasonal sensitivities for protected migratory species identified as potentially occurring within the PAA are identified in Table 4-11. Movement patterns of all protected species identified in **Section 4.6** are described in **Appendix I**.

As shown in Figure 4-7, the PAA is located 35 km from the PBW migratory corridor and 187 km from the PBW possible foraging area off North-west Cape / Ningaloo Coast.

In September 2021, DAWE and NOPSEMA released guidance on key terms within the Conservation Management Plan for the Blue Whale (the CMP)[3]. This guidance recognises the potential for whale foraging and feeding to occur in areas of high primary productivity outside of designated foraging areas. Migrating pygmy blue whales are not necessarily confined to the designated migratory corridor, and there is the potential for individuals to undertake opportunistic foraging within and adjacent to the PAA, particularly during the northbound migration.

**Table 4-11: Key seasonal sensitivities for protected migratory species identified as occurring within the PAA.**

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Fish, sharks and rays*** | | | | | | | | | | | | |
| Manta rays – presence/ aggregation/breeding (Ningaloo)[1] | | | | | | | | | | | | |
| ***Marine reptiles*** | | | | | | | | | | | | |
| Green turtle – various nesting/feeding/hatchlings/ mating areas within wider region*[2] | | | | | | | | | | | | |
| Flatback turtle – various nesting/feeding/hatchlings/ mating areas within wider region*[2] | | | | | | | | | | | | |
| Loggerhead turtle – various nesting areas within wider region*[2] | | | | | | | | | | | | |
| Hawksbill turtles – various nesting/hatchlings/mating areas within wider region*[3] | | | | | | | | | | | | |
| ***Mammals*** | | | | | | | | | | | | |
| Blue whale – northern migration (North West Cape, Montebello, Scott Reef)[4] | | | | | | | | | | | | |
| Blue whale – southern migration (North West Cape, Montebello, Scott Reef)[5] | | | | | | | | | | | | |
| Humpback whale – northern migration (Jurien Bay to Montebello)[6] | | | | | | | | | | | | |
| Humpback whale – southern migration (Montebello to Jurien Bay)[7] | | | | | | | | | | | | |
| ***Seabirds*** | | | | | | | | | | | | |

[3] https://www.environment.gov.au/epbc/publications/guidance-key-terms-blue-whale-conservation-management-plan

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wedge-tailed shearwater aggregation/breeding[8] | | | | | | | | | | | | |
| | Species may be present in the PAA | | | | | | | | | | | |
| | Peak period. Presence of animals is reliable and predictable each year | | | | | | | | | | | |

*[1] (CALM, 2005; DSEWPaC, 2012a; Environment Australia, 2002; Sleeman et al., 2010)*

*2 (Chevron Australia Pty Ltd, 2015; CALM, 2005; DSEWPaC, 2012a)*

*3 (Chevron Australia Pty Ltd, 2015; DSEWPaC, 2012a)*

*4 (DSEWPaC, 2012a, b; McCauley and Jenner, 2010; McCauley, 2011a)*

*5 (DSEWPaC, 2012a, b; McCauley and Jenner, 2010)*

*6 (CALM, 2005; Environment Australia, 2002; Jenner et al., 2001a; McCauley and Jenner, 2001)*

*7 (McCauley and Jenner 2001)*

*8 (CALM, 2005; Department of Environmental Protection, 2001; DSEWPaC, 2012b; Environment Australia, 2002)*

## 4.7 Key Ecological Features (KEFs)

The PAA is situated on the Exmouth Plateau and lies entirely within the Exmouth Plateau Key Ecological Feature (KEF). The Exmouth Plateau KEF starts approximately 110 km offshore and extends to 370 km from the shore. The KEF occupies an area of 49,310 km$^2$ within water depths of 800–4000 m (Exon and Wilcox, 1980, cited in Falkner et al., 2009; Heap and Harris, 2008).

KEFs within the EMBA are identified in Figure 4-12 and described in **Appendix I**. **Figure 4-7** shows the spatial overlap with KEFs and the PAA.

**Table 4-12: KEFs within the PAA and EMBA**

| Key Ecological Feature | Distance (km) and direction from PAA to KEF |
|---|---|
| Exmouth Plateau | Overlaps PAA |
| Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula | 116 km south-east |
| Continental Slope Demersal Fish Communities | 132 km south |

*note that the PMST identified that the EMBA overlaps the Ancient coastline at 125 m depth contour however further investigation confirmed there is no overlap with the EMBA

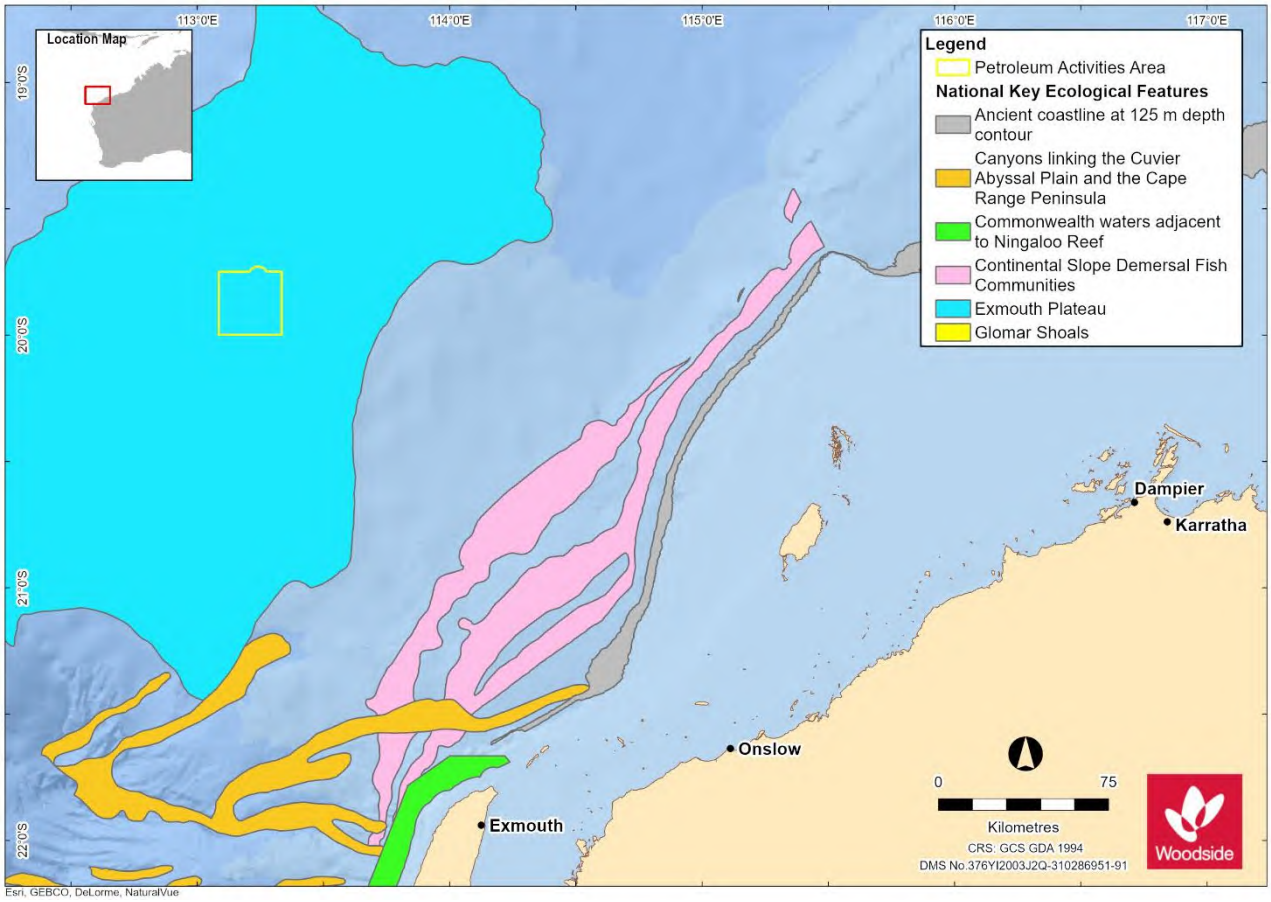



**Figure 4-7: KEFs overlapping the PAA**

## 4.8 Protected Places

No protected places overlap the PAA. Protected places within the EMBA are identified in Table 4-13: Established protected places and other sensitive areas overlapping the EMBA and presented in Figure 4-8. **Appendix I** outlines the values and sensitivities of protected places and other sensitive areas in the EMBA.

**Table 4-13: Established protected places and other sensitive areas overlapping the EMBA**

| | Distance (km) and direction from PAA to protected place or sensitive area | IUCN category* or relevant park zone overlapping the PAA and/or EMBA |
|---|---|---|
| ***Australian Marine Parks (AMPs)*** | | |
| Gascoyne AMP | 77 km south | IUCN VI |
| | 205 km south-west | IUCN II |
| | 207 km south-west | IUCN IV |
| ***State Marine Parks and Nature Reserves*** | | |
| Marine Parks | | |
| None | | |
| Marine Management Areas | | |
| None | | |
| Nature Reserves | | |
| None | | |
| ***Other protected areas*** | | |
| Fish Habitat Protection Areas | | |
| None | | |

**Conservation objectives for IUCN categories include:*

*Ia: Strict Nature Reserve*

*Ib: Wilderness Area*

*II: National Park*

*III: Natural Monument or Feature*

*IV: Habitat/Species Management Area*

*V: Protected Landscape*

*VI: Protected area with sustainable use of natural resources – allow human use but prohibits large scale development.*

*IUCN categories for the marine park are provided and, in brackets, the IUCN categories for specific zones within each Marine Park as assigned under the North-west Marine Parks Network Management Plan 2018 and South-west Marine Parks Network Management Plan 2018.*

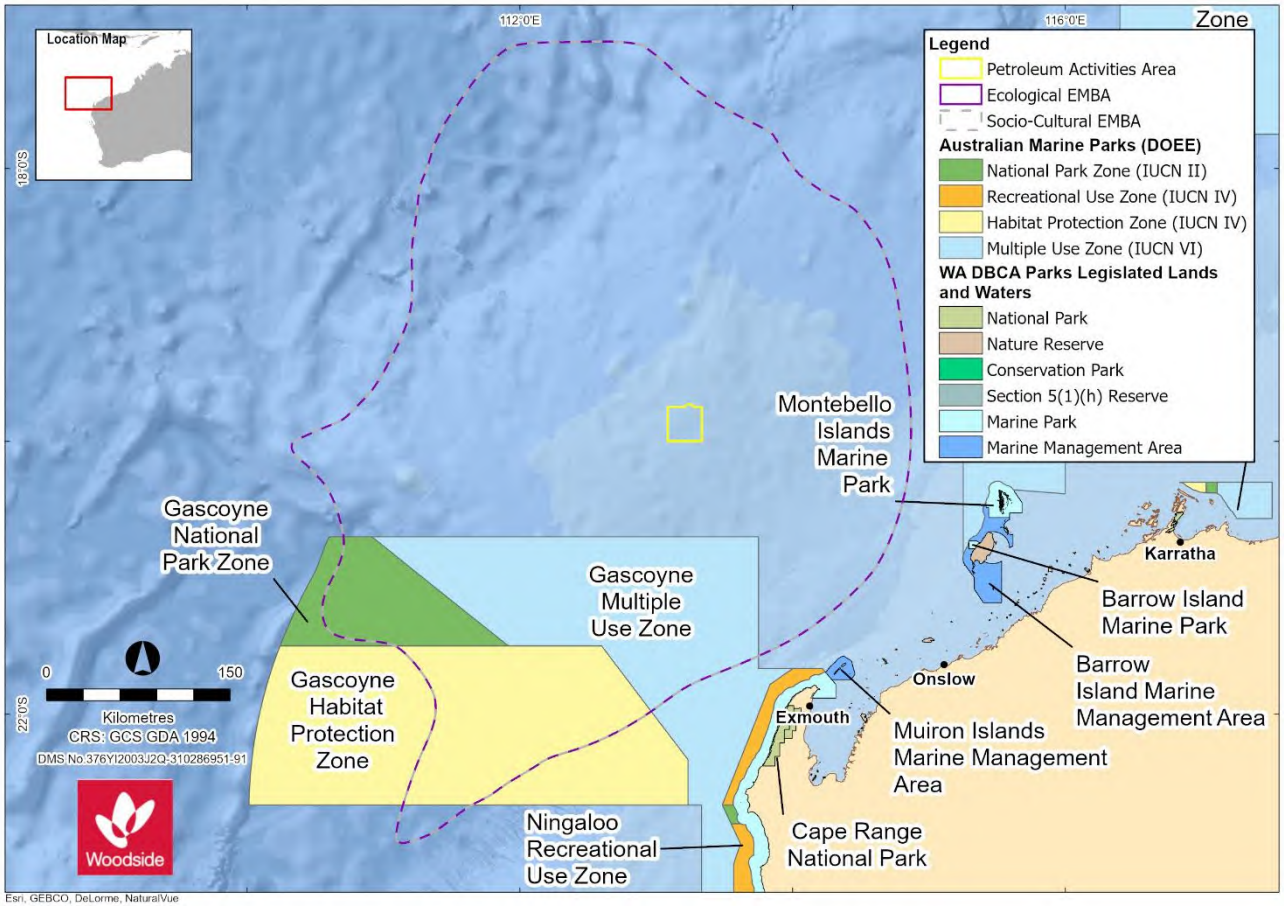



**Figure 4-8: Protected areas overlapping the EMBA**

## 4.9 Socio-economic Environment

### 4.9.1 Cultural Features and Heritage Values

#### 4.9.1.1 Background

Woodside recognises the 'environment' for the purpose of the evaluation required under the Environment Regulations includes:

- the heritage value of places; and
- the social, economic, and cultural features of the broader environment.

In this section, the heritage value of places within the Operational Area and EMBA and the cultural features of the Operational Area and EMBA are described.

In line with The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (ICOMOS 2013) (Burra Charter) and associated practice notes, Woodside understands heritage value to refer to the cultural significance of a place to an individual or group. A cultural feature, by contrast, is understood to be comparable to the Burra Charter term “fabric” and refer to a place’s elements, fixtures, contents and objects which have cultural values. Although these features are necessarily physical, the place they inhabit or comprise may have tangible and intangible dimensions (ICOMOS 2013).

Woodside has undertaken archaeological assessments and ethnographic surveys to identify potential cultural values or features that may be impacted by Scarborough activities. These works have not identified heritage places, objects or values which will be impacted by the activities planned

under this EP. However, through consultation with relevant persons, Woodside recognises the deep spiritual and cultural connection to the environment[4] that First Nations people hold.

### 4.9.1.2 First Nations Peoples

As a starting point for understanding cultural features of the environment for First Nations groups, Woodside uses the existing systems, such as native title, to identify First Nations groups that may have functions, interests or activities that may be affected. To that end, Woodside identifies native title representative bodies and nominated representative entities (defined in **Section 5.3**), as well as native title claims, determinations and Indigenous Land Use Agreements (ILUAs) which the EMBA overlaps. Native title claims, determinations and ILUAs are defined under the Native Title Act 1993 (Cth). While acknowledging that cultural features and heritage values may exist outside of the native title framework, Woodside considers this to be the broadest extent over which First Nations groups have claimed native title rights and interests.

Native title claims are applications made to the Federal Court under the Native Title Act for a determination or decision about native title in a particular area. A claim is made by a native title claim group which asserts it holds native title rights and interests in an area of land and/or water, according to its traditional laws and customs. By making a claim, the native title claim group seeks a decision that native title exists so that its native title rights and interests are recognised by the common law of Australia. This is called a native title determination. A determination is a decision by a recognised body, such as the Federal Court or High Court of Australia, that native title either does or does not exist in relation to a particular area (Native Title Tribunal).

A requirement to establishing a positive determination of native title in court is proving that there is an organised society that occupied the land and/or waters at the time of British annexation. The requirement of an 'organised society' is set out by Justice Toohey in the historic judgment of Mabo v Queensland (No 2) [1992] HCA 23; (1992) 175 CLR 1 ('Mabo'). Justice Toohey had the following to say (at 187):

it is inconceivable that indigenous inhabitants in occupation of land did not have a system by which land was utilized in a way determined by that society. There must, of course, be a society sufficiently organized to create and sustain rights and duties…

Therefore, Woodside understands that native title rights and interests are held communally by an organised society, that native title claims are understood to represent the area over which First Nations groups are claiming these rights and interests, and that native title determinations provide clarity on where native title rights and interests are found to either exist or not exist. Where native title rights or interests are determined to exist, they will be held by a Registered Native Title Body Corporate (section 57, *Native Title Act* 1993) in trust or as agent for native title holders.

ILUAs are voluntary agreements between native title parties and other people or bodies about the use and management of land and/or waters and are registered by the Native Title Registrar in the Register of ILUAs. An ILUA can be made over areas where:

- native title has been determined to exist in at least part of the area; or
- a native title claim has been made; or
- where no native title claim has been made.

While registered, ILUAs operate as a contract between the parties, including relevant native title holders (Native Title Tribunal).

[4] Definition of 'Environment' in Regulation 4 of the OPPGS (Environment) Regulations are defined as:
a) ecosystems and their constituent parts, including people and communities; and
b) natural and physical resources; and
c) the qualities and characteristics of locations, places and areas; and
d) the heritage values of places; and includes
e) the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d)

The Native Title Act also provides for a Representative Aboriginal/Torres Strait Islander Body (Native Title Representative Body) to be recognised by the Commonwealth Minister for an area. Native Title Representative Bodies have specialist functions set out in the Native Title Act within the area for which they are the Native Title Representative Body. However, the functions of a Native Title Representative Body are such that they do not hold details on the cultural features or heritage values of an area and therefore do not inform Woodside's understanding of heritage values or cultural features.

For the activity in this EP, there are no native title claims or determinations and no ILUAs overlapping the PAA and EMBA (see **Figure 4-9**). Therefore Woodside understands that no native title rights or interests may be impacted by the activity. A summary of native title claims, determinations and ILUAs which are coastally adjacent to the EMBA is set out in **Table 4-14**. Claims and determinations have not been differentiated in this table, as it is acknowledged that rights and interests may exist within either of these.

#### 4.9.1.3 Coastally Adjacent First Nations Groups

Woodside understands that First Nations groups are keenly aware of the extent of their rights, interests and responsibilities for Country, and these are generally discrete, defined areas, including areas of sea (Smyth 2007). To identify cultural features and heritage values which may exist outside of native title claim, determination and ILUA areas, Woodside considers native title claims, determinations and ILUAs coastally adjacent to the EMBA to be an instructive means of identifying potentially relevant First Nations groups to be consulted (See **Table 4-14**).

That said, Woodside understands from engagement with stakeholders that extending a native title group's responsibility to areas which those groups have elected to not include in their claims or ILUAs can have significant cultural consequences for First Nations groups and individuals. This may also, over time, build expectations in the broader First Nations community that a group is responsible for maintaining environmental values in areas for which they do not hold traditional knowledge. Woodside also acknowledges that a First Nations group's relative proximity to the PAA or EMBA is not necessarily a meaningful indicator of the connection of First Nations groups to the area, and providing advice over such areas can be culturally dangerous. As a result, caution must be used when conducting broader engagement.

A summary of native title claims, determinations and ILUAs overlapping or coastally adjacent to the EMBA is set out in **Table 4-14**. Claims and determinations have not been differentiated in this table, as it is acknowledged that either of these may indicate the existence of rights and interests.

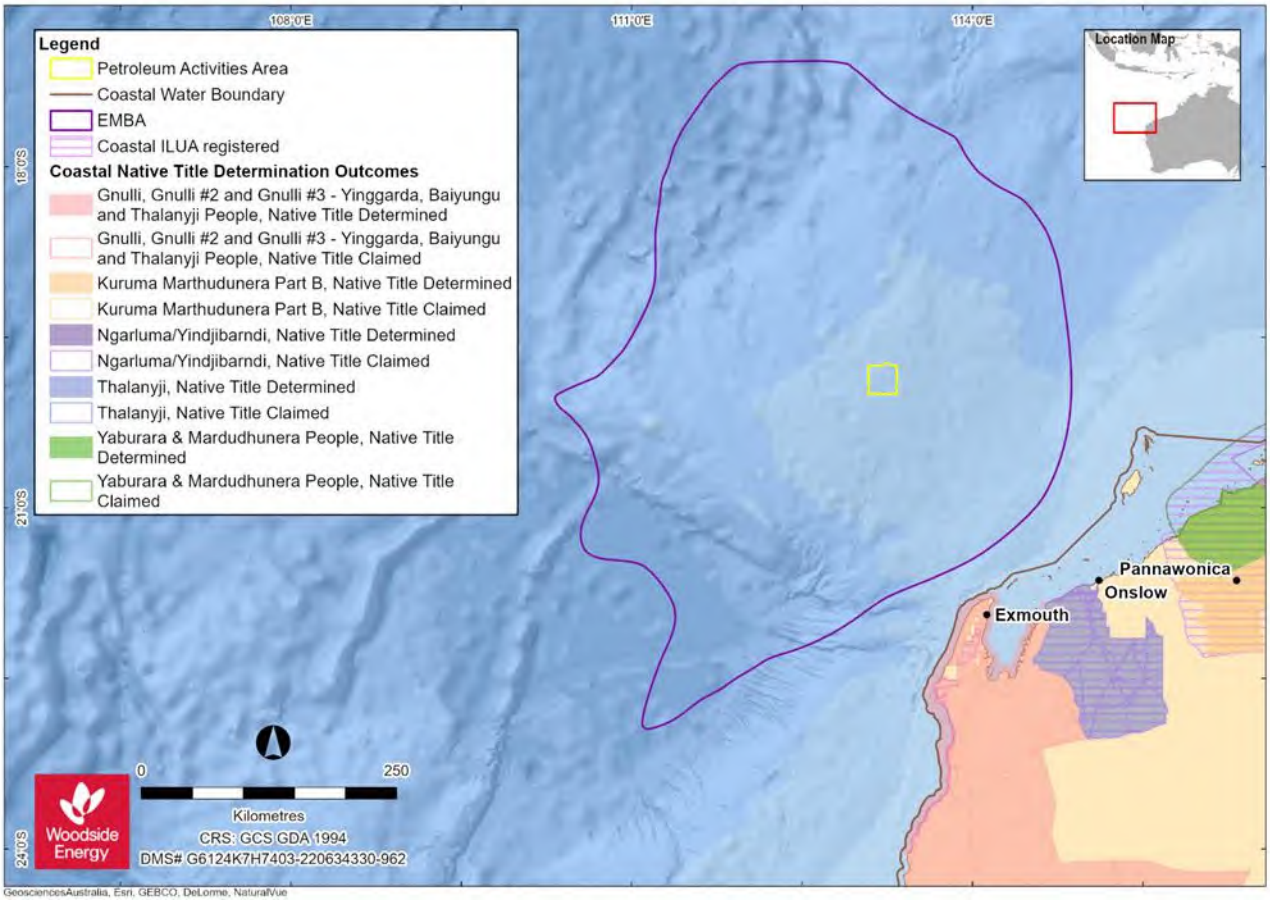



**Figure 4-9: PAA and EMBA in relation to native title claims, determinations and ILUAs**

**Table 4-14: Summary of Native Title Claims, Determinations and ILUAs which overlap or are coastally adjacent to the EMBA.**

| Claim / Determination / ILUA | Registered Native Title Body Corporate | Overlap with EMBA | Coastally Adjacent to the EMBA |
|---|---|---|---|
| ***Claim / Determination*** | | | |
| Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People | Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC), Yinggarda Aboriginal Corporation (YAC) | No | Yes |
| Ngarluma/Yindjibarndi People | Ngarluma Aboriginal Corporation (NAC), Yindjibarndi Aboriginal Corporation | No | Yes |
| Thalanyji | Buurabalayji Thalanyji Aboriginal Corporation (BTAC) | No | Yes |
| Yaburara & Mardudhunera People | Wirrawandi Aboriginal Corporation (WAC) | No | Yes |
| ILUA | | | |

| Claim / Determination / ILUA | Registered Native Title Body Corporate | Overlap with EMBA | Coastally Adjacent to the EMBA |
|---|---|---|---|
| Cape Preston Project Deed (YM Mardie ILUA) | WAC | No | Yes |
| Cape Preston West Export Facility | WAC | No | Yes |
| KM & YM ILUA | WAC, Robe River Kuruma Aboriginal Corporation | No | Yes |
| Kuruma Marthudunera and Yaburara and Coastal Mardudhunera Indigenous Land Use Agreement | No representative body specified. | No | Yes |
| Macedon ILUA | BTAC | No | Yes |
| Ningaloo Conservation Estate ILUA | NTGAC | No | Yes |
| RTIO Ngarluma ILUA (Body Corporate Agreement) | NAC | No | Yes |
| RTIO Kuruma Marthudunera People ILUA | Robe River Kuruma Aboriginal Corporation | No | Yes |

#### 4.9.1.4 Marine Parks

Woodside acknowledges that Commonwealth and State Marine Park Management Plans have sought to recognise cultural values of First Nations groups. Australian Marine Parks (AMP) describe this framework in the following way: ‘when making decisions about what can occur in marine parks and what action we will take to protect marine parks, we take values into account’. AMP summarises these values as natural values, cultural values, heritage values and socio-economic values.

Woodside is triggered to undertake an assessment of cultural values within Marine Park Management Plans where the operational area or EMBA overlaps an AMP. Woodside considers the management plans of marine parks that overlap the PAA and EMBA to determine whether cultural features and heritage values have been identified and whether there are specified Traditional Custodians or representative bodies referenced to contact regarding potential cultural features and heritage values.

The PAA does not overlap any Commonwealth Marine Parks. The EMBA overlaps with features of the Gascoyne AMP managed under the North-West Marine Parks Network Management Plan 2018. The PAA and the EMBA do not overlap any State Marine Parks. Where these plans specify identifiable representative bodies who may hold knowledge of heritage values or cultural features—

including but not limited to Registered Native Title Bodies Corporate—these bodies are consulted (See **Table 5-2**). Consultation with these groups may identify heritage values and cultural features beyond those addressed in the marine park management plans. No identifiable representative bodies were specified for the marine parks overlapped by the EMBA (See **Table 4-15**).

The marine park management plans did note for the Gascoyne AMP that the Yamatji Marlpa Aboriginal Corporation (YMAC) is the relevant Native Title Representative Body. YMAC was requested to identify Traditional Custodians who may hold knowledge of heritage values or cultural features (See **Appendix F**, Table 1).

**Table 4-15: Summary Marine Park Management Plans that overlap the EMBA**

| Marine Park Management Plan | PAA Overlap | EMBA Overlap | Specified Bodies |
|---|---|---|---|
| ***Commonwealth Marine Park Management Plan*** | | | |
| Gascoyne AMP | No | Yes | No identifiable body specified. |
| ***State Marine Park Management Plan*** | | | |
| [None] | | | |

### 4.9.1.5 Sea Country Values

'Sea Country' can be defined as the area of sea over which a First Nations group has interests, cultural value, connection and use. It has been noted that "the saltwater peoples of the north-west are associated with discrete clan estates or tribal areas, often referred to in contemporary Aboriginal English as 'saltwater country' or 'sea country'. 'Country' refers to more than just a geographical area: it is shorthand for all the values, places, resources, stories and cultural obligations associated with that geographical area." (Smyth 2007). "Sea country is valued for Indigenous cultural identity, health and wellbeing" (DNP 2018b). Cultural identity is understood to refer to the fact that "essence of being a 'Saltwater' person is ontological rather than merely technological. That is, it is about how people relate spiritually to the sea and engage with spiritual forces that created it, the marine flora and fauna and people" (McDonald and Phillips, 2021).

In terms of seascape extent, McNiven (2004) suggests that "For those mainland groups whose exploitation of the sea was limited to littoral resources, it is likely that seascapes extended no more than c. 20–30km out to sea, out to the horizon and the limit of human visibility. ... However, in some coastal places, clouds that can be seen well over 100km out to sea are imbued with spiritual significance. For those groups with elaborate canoe technology, seascapes extend well over the horizon." While there is some evidence of traditional watercraft in Australia's North West, the recorded evidence is limited to travel across inland rivers (e.g. Barber and Jackson 2011) or travel between coastal islands (Paterson et al 2019).

Woodside recognises the potential for marine ecosystems to include cultural features as well as environmental values. The link between environmental protection and cultural heritage protection is illustrated in the Australian Government's Indigenous Protected Areas Program. The Indigenous Protected Areas program provides for "areas of land and sea managed by Indigenous groups as protected areas for biodiversity conservation…IPAs deliver environmental benefits…Managing IPAs also helps Indigenous communities protect the cultural values of their Country for future generations…" (DCCEEW, 2023). This intrinsic link concept is also described by MAC (2021) as it relates to the values of the marine environment that are of cultural importance to MAC based on engagement with their Elders and Murujuga Land and Sea Unit Rangers. Elders were clear that all living things in Mermaid Sound are connected and that Mermaid Sound and Dampier Archipelago (Murujuga) are considered one place where the entire environment and all ecosystems hold both cultural and environmental value, with these types of values (cultural and environmental) intrinsically linked (MAC, 2021 as cited in Woodside 2023a).

Cultural features of coastal areas may include marine species that may travel many thousands of kilometres through areas with similar cultural values to multiple First Nations language groups. Some species may travel as far as 5,000 km from Antarctica to the Kimberley region of Western Australia (Double et al., 2010, 2012), passing First Nations language groups along the entire west coast of Australia. Distribution and migratory patterns of migratory species are described in **Section 4.6** and **Appendix I**.

Sea Country values have been defined using multiple lines of evidence including:

- Desktop assessment of Sea Country values from publicly available sources
- Specific studies including ethnographic surveys and archaeological heritage assessments
- Consultation with First Nations groups and individuals

The process for identifying First Nations groups who may have interests and connection in Sea Country are set out in **Section 4.9.1.3**and **Section 5.8**. The scope of advice Traditional Custodians were encouraged to provide through ethnographic surveys (see **Section 4.9.1.5.2**) or through project consultation was not limited by reference to any particular boundaries or limits of Sea Country.

#### 4.9.1.5.1 Desktop Assessment of Sea Country Values

##### *Cultural features and heritage values identified in publicly available literature*

Publicly available sources were assessed for any records of previously identified Sea Country values or cultural features that may overlap with the EMBA or PAA. Where cultural features or Sea Country values were identified these are summarised in **Table 4-17** according to the First Nations groups (where identified or inferable) who hold these values.

All cultural features and heritage values restricted to onshore locations or inland waters have been excluded in **Table 4-17**, noting that the closest boundary of the PAA is greater than 360 km west-north-west of Dampier, and greater than 215 km from the closest landfall at North West Cape, while the boundary of the EMBA is about 40 km from closest landfall with no shoreline contact. Where the geographical extent is not specified or unclear it has been included for completeness.

**Table 4-16: Cultural features and heritage values identified in publicly available literature**

| First Nations Group | Features and Values | Source | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| Gnulli<br>(Baiyungu, Thalanyji, Yinggarda) | Feature: resources including marine animals.<br>Value: traditional knowledge holds that ancestors live on the land and in the water. Therefore, people have obligations to access and care for these places (e.g. keeping them clean). | Peck on behalf of the Gnulli Native Title Claim Group v State of Western Australia [2019] FCA 2090 | Yes<br>Possible (unspecified) | Yes<br>Possible (unspecified) |
| | Feature: resources including mangrove crabs, gastropods, shellfish, dugong, turtle). | Morse 1993 | Likely to occur (turtle; **Table 4-6**)<br>No (other resources) | Known to occur (turtle; **Table 4-6**)<br>No (other resources) |
| Ngarda-Ngarli<br>(Mardudhunera, Ngarluma, Wong-Goo-Tt-Oo, Yaburara and/or Yindjibarndi) | Feature: archaeological sites on Murujuga.<br>Feature: ceremonial sites.<br>Feature: dreaming sites. | Department of the Environment and Heritage 2006 | No<br>No<br>Possible (unspecified) | No<br>No<br>Possible (unspecified) |
| | Value: traditional knowledge recalls that the sea is a source of creation for flying foxes.<br>Value: petroglyphs are understood as permanent signs left by ancestral beings.<br>Value: petroglyphs depict the law.<br>Value: cultural obligations to look after places of special potency.<br>Value: petroglyphs are important in initiation and education. | DEC 2013 | Possible (unspecified)<br>No<br>No<br>Possible (unspecified) – unlikely given distance offshore<br>No | Possible (unspecified)<br>No<br>No<br>Possible (unspecified) – unlikely given distance offshore<br>No |
| | Value: the sea is acknowledged a starting point for songlines, including the flying fox songline. | MAC 2023a | Possible (unspecified) | Possible (unspecified) |
| | Feature: resources including fishes, turtles and dugong.<br>Value: traditional knowledge recalls a sea serpent which travelled from the coast to inland pools. | Water Corporation 2019 | Likely to occur (turtle; **Table 4-6**)<br>Known to occur (fish)<br>No (dugongs; Appendix C)<br>Possible (unspecified) | Known to occur (turtle; **Table 4-6**)<br>Known to occur (fish)<br>No (dugongs; Appendix C)<br>Possible (unspecified) |

| First Nations Group | Features and Values | Source | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | Value: traditional knowledge recalls a water serpent from the ocean now lives in an inland pool. He created many sites and punishes law breakers.<br><br>Value: In a separate account a sea serpent punishing people was driven back to the sea by a freshwater serpent. | Barber and Jackson 2011 | Possible (unspecified) – unlikely given distance offshore<br><br>Possible (unspecified) | Possible (unspecified) – unlikely given distance offshore<br><br>Possible (unspecified) |
| | Value: traditional knowledge recalls Manggan created the seas. | NAC n.d. | Yes | Yes |
| | Value: traditional knowledge recalls Pannawonica Hill being carried from the sea near Barrow Island or Murujuga by a spirit bird. | Hook et al 2004 | No | No |
| | Value: traditional knowledge recalls Murujuga is where ancestral beings emerged from the sea and brought the Law. | Australian Heritage Council 2012 | Possible (unspecified) – unlikely given distance offshore | Possible (unspecified) – unlikely given distance offshore |
| | Feature: Submerged First Nations archaeological sites in Cape Bruguieres channel.<br>Feature: Submerged First Nations archaeological sites in Flying Foam Passage. | Benjamin et al 2020 | No<br><br>No | No<br><br>No |
| | Feature: Submerged First Nations archaeological sites in Cape Bruguieres channel.<br>Feature: Submerged First Nations archaeological sites in Flying Foam Passage. | Benjamin et al 2023 | No | No |
| | Value: traditional knowledge recalls Maarga (creation ancestors) lifted the land and sky out of the ocean. | Milroy and Revell 2013 | Possible (unspecified) | Possible (unspecified) |
| | Value: traditional knowledge recalls Maarga (creation ancestors) lifted the land and sky out of the ocean. | Japingka Aboriginal Art Gallery 2023 | Possible (unspecified) | Possible (unspecified) |
| | Feature: submerged waterholes related to the Kangaroo songline.<br><br>Value; traditional knowledge holds that Songlines continue beyond the current coast and across the submerged landscape. | Kearney et al 2023 | No (feature restricted to Ancient Landscape)<br>Possible (unspecified) | No (feature restricted to Ancient Landscape)<br>Possible (unspecified) |

| First Nations Group | Features and Values | Source | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | Value: songlines are captured through storytelling, rock art, songs and dance, and in the landmarks themselves.<br>Value: Murujuga is the start of many songlines, including the Seven Sisters. | Bainger 2021 | No<br>No | No<br>Possible (unspecified) |
| | Value: songlines at Murujuga date back to times when the sea-level was lower. | MAC 2023b. | Possible (unspecified) – unlikely given distance beyond Ancient Landscape | Possible (unspecified) |
| | Feature: rock art<br>Feature: sacred sites. | Weerianna Street Media Production 2017. | No<br>Possible (unspecified) – unlikely given distance beyond Ancient Landscape | No<br>Possible (unspecified) |
| | Feature: resources including fish, turtles.<br>Feature: fish traps exist throughout the archipelago.<br>Feature: shell middens exist on coastal margins.<br>Feature: submerged archaeological sites.<br>Value: Law emerged from the sea and travelled inland. | Leach 2020 | Likely to occur (turtle; **Table 4-6**)<br>Known to occur (fish)<br>No<br>No<br>No (feature restricted to Ancient Landscape)<br>Possible (unspecified) | Known to occur (turtle; **Table 4-6**)<br>Known to occur (fish)<br>No<br>No<br>No (feature restricted to Ancient Landscape)<br>Possible (unspecified) |
| | Feature: archaeological sites on Murujuga. | McDonald 2023 | No | No |
| | Feature: archaeological sites on Murujuga. | McDonald 2015 | No | No |
| | Feature: archaeological sites on Enderby Island. | McDonald et al 2022a | No | No |
| | Feature: archaeological sites on Rosemary Island. | McDonald et al 2022b | No | No |
| | Feature: petroglyphs on Murujuga. | Mulvaney 2015. | No | No |

| First Nations Group | Features and Values | Source | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | Feature: resources including mangrove seeds, turtles, turtle eggs).<br><br>Value: it is recalled that ceremonies were conducted on islands. | Smyth 2007 | Likely to occur (turtle; **Table 4-6**)<br>No (other resources)<br><br>No (onshore) | Known to occur (turtle; **Table 4-6**)<br>No (other resources)<br><br>No (onshore) |
| | Feature: petroglyph and other archaeological sites at Murujuga. | Dortch et al 2019. | No | No |
| Thalanyji | Feature: resources including fish, shellfish, crabs, crustaceans, sea urchins, turtle, dugong and flora and fauna associated with mangrove communities.<br><br>Feature: archaeological sites on Barrow Island.<br>Value: connection to Country. | Commonwealth of Australia 2002 | Likely to occur (turtle; **Table 4-6**)<br>Known to occur (fish)<br>No (dugongs, other resources)<br><br>No (onshore)<br>Possible (unspecified) | Known to occur (turtle, **Table 4-6**)<br>Known to occur (fish)<br>No (dugongs, other resources)<br><br>No (onshore)<br>Possible (unspecified) |
| | Feature: resources include turtles, eggs, fish, shellfish and plants. | DBCA et al. 2002 | Likely to occur (turtle; **Table 4-6**)<br>Known to occur (fish)<br>No (other resources) | Known to occur (turtle, **Table 4-6**)<br>Known to occur (fish)<br>No (other resources) |
| | Value: traditional knowledge recalls a water snake is located in inland waters. | Hayes on behalf of the Thalanyji People v State of Western Australia [2008] FCA 1487 | No (inland waters) | No (inland waters) |
| | Value: connection to Country.<br>Value: transfer of knowledge.<br>Value: access to Country. | DBCA 2022 | Possible (unspecified)<br>Possible (unspecified)<br>Possible (unspecified) | Possible (unspecified)<br>Possible (unspecified)<br>Possible (unspecified) |
| | Value: access to Barrow and possibly Montebello Islands. | Hook 2004 | No | No |

| First Nations Group | Features and Values | Source | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | Feature: artefact scatters are located in coastal sand dunes.<br>Feature: burials are located in coastal sand dunes.<br>Value: traditional knowledge recalls a water snake is located in inland waters. | Hook 2020. | No<br>No<br>No | No<br>No<br>No |
| | Feature: archaeological sites are located on Barrow Island. | Ditchfield et al. 2018 | No | No |
| | Feature: thalu ceremonial sites for the increase of turtle, shark, ray, fish, squid, octopus, hill kangaroo and emu.<br>Feature: ceremonies.<br>Value: connection to Country.<br>Value: transfer of knowledge.<br>Value: access to Country. | DBCA 2022 | No<br>No<br>Yes<br>Yes<br>Yes | No<br>No<br>Yes<br>Yes<br>Yes |
| | Feature: archaeological sites are located at Barrow and Montebello Islands.<br>Feature: archaeological evidence of the use of resources including fish, turtles, marine mammals, crocodiles, crabs and sea urchins. | Dortch et al. 2019. | No<br>No | No<br>No |
| | Feature: archaeological sites are located on Barrow Island. | Paterson 2017 | No | No |
| Unspecified | Feature: the ocean can include sacred sites and songlines.<br>Value: people have kin relationships to important animals, plants tides and currents. | Smyth 2008 | Possible (unspecified) – unlikely given distance offshore<br>Possible (unspecified) | Possible (unspecified)<br>Possible (unspecified) |
| | Feature: archaeological sites in submerged landscapes. | Bradshaw 2021 | No (feature restricted to Ancient Landscape) | No (feature restricted to Ancient Landscape) |
| | Value: Sea Country has customary law defining ownership and management rights and responsibilities. | Muller 2008 | Possible (unspecified) | Possible (unspecified) |

| First Nations Group | Features and Values | Source | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | Value: knowledge of Sea Country.<br>Value: connection to Sea Country.<br>Value: care for Sea Country.<br>Value: the extent of Sea Country is determined by the travels of dreaming ancestors. This is recorded and conveyed through songlines. | Kearney et al 2023 | Possible (unspecified)<br>Possible (unspecified)<br>Possible (unspecified)<br>Possible (unspecified) | Possible (unspecified)<br>Possible (unspecified)<br>Possible (unspecified)<br>Possible (unspecified) |
| | Feature; archaeological sites indicate that islands were occupied prior to sea level rise. | DBCA 2020 | No | No |
| | Value: Sea Country includes values, places, resources, stories and cultural obligations.<br>Value: activities relating to resources included:<br>• Dugong hunting;<br>• Turtle hunting;<br>• Turtle egg collecting;<br>• Seabird egg collecting;<br>• Spearing fish;<br>• Reef trapping fish;<br>• Herding fish;<br>• Line fishing;<br>• Collecting fish in stone fish traps;<br>• Poisoning fish;<br>• Gathering shellfish and other marine resources. | Smyth 2007 | Possible (unspecified)<br>Possible (unspecified) – unlikely given distance offshore | Possible (unspecified)<br>Possible (unspecified) – unlikely given distance offshore |
| | Value: people have kinship relationships with every plant and animal.<br>Value: certain species, including fish and seafood, must not be eaten during initiation rituals due to their sacredness to the creation being Barrimirndi. Breaking this law may lead to cyclones. | Juluwarlu 2004 | Possible (unspecified)<br>No | Possible (unspecified)<br>No |

| First Nations Group | Features and Values | Source | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | Feature: tangible and intangible heritage.<br>Feature: archaeological evidence of varied occupation and adaptation.<br>Value: a distinct way of life centred around the use of limited water and coastal resources. | Macfarlane and McConnell 2017 | Possible (unspecified)<br>No (feature restricted to Ancient Landscape)<br>No | Possible (unspecified)<br>No (feature restricted to Ancient Landscape)<br>No |

#### 4.9.1.5.2 Studies of Cultural Features and Heritage Values

### *First Nations Archaeological Heritage Assessment*

Woodside understands that communal cultural connection may exist between Traditional Custodians and land and waters. It is understood from the onshore archaeological record that First Nations people have occupied the Australian continent for at least 65,000 years (Clarkson et al 2017) and in many places maintain a strong continuing connection that is said to extend back in First Nations cosmology to the beginning of time.

It is understood that the sea level has risen significantly during the 65,000 years of First Nations occupation, and areas that were once inhabited are now submerged on the continental shelf (Veth et al 2019; UWA 2021). Woodside also understands that, at its lowest level during First Nations occupation, sea level was between 125 m (O'Leary et al 2020, Veth et al 2019, Williams et al 2018) and 130 m below current levels (Benjamin et al 2020, Benjamin et al 2023, UWA 2021). Archaeological material preserved on the Ancient Landscape has the potential to provide further information about the earliest periods of human occupation (Veth et al 2019; UWA 2021).

Recent archaeological discoveries demonstrate that the now submerged landscape was occupied and inhabited, and can retain archaeological material from this time (Benjamin et al, 2020; Benjamin et al 2023; see Ward et al 2021 for an opposing view).

In recognition of this, Woodside considers the Ancient Landscape between the mainland and the Ancient Coastline KEF (see **Figure 4-7**) as an area where potential First Nations archaeological material may exist on the seabed, as this covers the full extent of this possible First Nations occupation. The PAA and EMBA do not overlap the Ancient Landscape.

Known First Nations heritage places including archaeological sites may be protected subject to declarations under the Aboriginal and Torres Strait Islander Heritage Protection Act 1984, Underwater Cultural Heritage Act 2018 or EPBC Act 1999. However, these Acts only extend protection to First Nations heritage places specified by declaration or otherwise included on a statutory list. Woodside understands that there is no First Nations archaeology known to exist anywhere within Commonwealth waters, and no areas subject to declarations or prescriptions under these Acts are located within the EMBA.

For this EP, a search of DPLH's Aboriginal Cultural Heritage Inquiry System was undertaken, which showed no registered Aboriginal sites in the EMBA (see Appendix G).

Where First Nations archaeological material is identified within the EMBA, Woodside will discuss the management of this material with appropriate Traditional Custodian group(s), starting with any adjacent Native Title Body Corporate.

### *First Nations Ethnographic Heritage Assessment*

Ethnographic surveys are a form of heritage survey conducted by anthropologists or ethnographers to understand cultural features of heritage significance and heritage values within a landscape. This is distinguished from an archaeological survey (which focusses on the material remains of human culture) and consultation (which is not confined to an assessment of heritage, is not limited to values of a landscape and may be conducted without an ethnographic methodology).

Ethnographic surveys are *undertaken to identify Aboriginal cultural heritage sites and values that are identifiable as tangible and intangible elements that are important to the Aboriginal people of the State, and are recognised through social, spiritual, historical, scientific or aesthetic values, as part of Aboriginal tradition.*

*To achieve this, an ethnographic survey is undertaken with an Aboriginal person or persons who in accordance with Aboriginal tradition, holds particular knowledge about the Aboriginal cultural*

*heritage and has traditional rights, interests and responsibilities in respect of the Aboriginal cultural heritage* (Mott 2023).

Woodside seeks to undertake ethnographic surveys where planned impacts overlap an area where a First Nations group has an established cultural jurisdiction over an area of land or sea. Cultural jurisdiction is essential to ensure ethnographic survey participants "in accordance with Aboriginal tradition, hold particular knowledge about the Aboriginal cultural heritage", and may be established through a number of mechanisms, including prescription under heritage legislation, recognition through the determination of Native Title rights, or through land access agreements including ILUAs or ILUA-like agreements.

Where ethnographic surveys are requested during broader consultation in which a relevant person articulates their cultural jurisdiction, Woodside will assess this request and, where appropriate undertake surveys. Surveys may not be appropriate, for example, where another party has established cultural jurisdiction or an adequate ethnographic survey has already been carried out over the area.

As ethnographic surveys are dependent on the participation of traditional knowledge holders, it is not possible to meaningfully conduct ethnographic surveys proactively over areas for which cultural jurisdiction is not established or unclear.

To supplement understanding of the area subject to MAC's cultural jurisdiction nearshore, Woodside commissioned an ethnographic survey to support the Scarborough Project (McDonald and Phillips 2021), including the PAA (See **Table 4-14**). An ethnographic survey determines both the tangible and intangible cultural heritage which may be associated with a particular story, person/peoples, animals, plants, area, features or objects. Typical results from surveys of this nature may include the identification of songlines, ceremonial places such as 'thalu' sites for managing environmental resources, or places where activities such as birthing, initiation or other significant activities are performed. As a form of heritage survey, distinct from more general consultation, surveys were limited to discussions of the relevant landscape. However, participants were not restricted in the types of tangible and intangible cultural heritage they were encouraged to identify.

The survey was conducted by MAC as representatives of Traditional Custodians for the onshore and nearshore aspects of the Scarborough Project. MAC appointed their preferred heritage consultants to meet on Country with the MAC Circle of Elders to discuss the project and identify any cultural values (McDonald and Phillips 2021). The resulting report is owned by MAC and was approved by the Circle of Elders prior to being provided to Woodside. Representatives from the Mardudhunera, Ngarluma, Yaburara, Yindjibarndi and Wong-Goo-Tt-Oo Peoples—all five First Nations groups represented by MAC (MAC 2022)—participated in this survey (McDonald and Phillips 2021). The scope of works for this survey defines the purpose of this survey as follows:

> *The ethnographic consultation aims at providing an understanding of the cultural heritage values associated with the submerged landscape.*
>
> *Specifically, the survey and reporting will provide Woodside understanding of the cultural values within the coastal, nearshore and offshore proposed Scarborough trunkline and associated works areas.*

The scope of the assessment was informed by the Scarborough project's development footprint as provided in **Figure 4-10**, however a landscape-scale approach was undertaken, considering heritage values that may be identified by participants well beyond this footprint. No boundary was imposed on the participants, and participants were not restricted in the types of heritage value they were encouraged to identify. As an indication of the breadth of the cultural landscape that the survey considered, cultural features and heritage values were identified more than 60 km from the development footprint. Participants were shown an introductory video explaining the key parameters of the Scarborough project including the proposed pipeline (McDonald and Phillips 2021).

The survey identified ethnographic sites onshore, but these are outside the PAA and EMBA and hence scope of this EP (McDonald and Phillips 2021). It is not appropriate or practical to request Traditional Custodians to list all ethnographic values onshore which they have not identified as potentially impacted, however some identified in the report included stories related to Eaglehawk Island and several sites at Withnell Bay. Some of these sites have spiritual connections throughout the landscape including to Cape Preston and Depuch Island. It was not proposed in the report that the Project would pose any risk to these sites or values, which are located well outside the EMBA. It was noted that some traditional knowledge of ethnographic values may have been lost through the effects of colonisation generally, and as a result of the Flying Foam Massacre in particular (McDonald and Phillips 2021).


**Figure 4-10: Scarborough Development Location considered in the 2020 ethnographic survey (McDonald and Phillips 2021)**

### *Future Ethnographic Surveys*

McDonald and Phillips (2021) represents the findings of Phase I of a planned two-part ethnographic survey, and recommends that the Phase II ethnographic survey be initiated. The second phase goes beyond industry standard by engaging with neighbouring First Nations groups to identify potential ethnographic values that traverse traditional group boundaries. Per **Appendix F**, Table 1, Woodside has communicated its commitment to the Phase II survey to MAC on multiple occasions, is ready to progress these at MAC's earliest availability, and believes it has taken all reasonable steps to progress the Phase II survey. MAC has not yet elected to progress this work.

Phase I of the ethnographic survey was run by MAC, and the scope of this survey required "Full recording and significance assessment. The consultant is to provide advice as to whether there are cultural values within and nearby the footprint area..." Discussion with MAC's then CEO has confirmed that MAC do not consider that they have failed to deliver on this scope. The survey was

conducted with members of MAC's Circle of Elders, who are recognised as cultural authorities for Murujuga, and the final report was approved by the Circle of Elders prior to being provided to Woodside.

Therefore, Woodside understands the Phase I works to adequately describe and assess the cultural, spiritual, aesthetic and social values held by Traditional Custodians for the project area and surrounding land and seascape. Woodside does not consider the Phase II works to be necessary to the construction of the Scarborough Project.

Woodside has also conducted extensive engagement with appropriate representatives as determined by MAC over the course of several years, as well as a number of neighbouring First Nations groups and representatives as detailed in **Section 5**. As reported in **Section 4.9.1.5.3**, this consultation with MAC has resulted in the detailing of cultural values beyond the heritage values that may be identified through ethnographic survey, and in greater detail than the results of ethnographic survey to date. On 21 July 2023, MAC advised by letter that MAC "have no concerns at this point in time" regarding the proposed activities subject to this EP.

Beyond MAC, no First Nations group has articulated cultural jurisdiction over any area of waters subject to impacts from planned activities. BTAC has stated that their Sea Country extends "out to the vast islands off the coast of the Pilbara, including the Monte Bello Islands, Barrow Island, and the Mackerel Islands." These locations are outside of the extent of planned impacts. A review of publicly available literature has been undertaken to seek clarity on the extent of Sea Country for Thalanyji people in **Section 4.9.1.5.3** and has not identified any areas recorded as Thanlyji Sea Country which overlap the extent of proposed impacts

Woodside has offered support, through ongoing consultation, for initiatives proposed by Traditional Custodians to record Sea Country values (see Program of Ongoing Engagement with Traditional Custodians, Appendix J).

Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received (including any relevant new information on cultural values from the Phase II survey or other sources), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see **Section 7.8**).

### 4.9.1.5.3 Consultation Feedback to Inform Existing Environment

#### *Summary of values raised during consultation*

A summary of the topics/interests and values raised by First Nations groups through consultations on this Petroleum Activities Program, or raised in context of general Scarborough Project activities or other activities are provided in **Table 4-17**.

First Nations cultural values are communally held. This is reflected in Vision 3 of Dhawura Ngilan that "Aboriginal and Torres Strait Islander heritage is managed... according to community ownership" (Heritage Chairs of Australia and New Zealand 2020). Dhawura Ngilan also specifically notes that "Aboriginal and Torres Strait Islander... intangible knowledge systems, which are held in songlines and language, are endangered. This knowledge is held by Elders and the community..." Through consultation Registered Native Title Bodies Corporate and nominated representative corporations have identified or raised topics relating to environmental values of cultural interest. Woodside recognises the deep spiritual and cultural connection to the environment[5] that First Nations people hold.

[5] Definition of 'Environment' in Regulation 4 of the OPPGS (Environment) Regulations are defined as:
- a) ecosystems and their constituent parts, including people and communities; and
- b) natural and physical resources; and
- c) the qualities and characteristics of locations, places and areas; and
- d) the heritage values of places; and includes
- e) the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d)

The Program of Ongoing Engagement with Traditional Custodians (Appendix J) provides a mechanism for ongoing dialogue between Woodside and Traditional Custodians, beyond that required by regulation 11A. The program enables Woodside to manage the potential impacts and risks to cultural values which may be identified at any time during Woodside's activities via ongoing dialogue with Traditional Custodians. As an example, Woodside is developing a framework for ongoing consultation with BTAC and other groups (Appendix J). Should feedback be received (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see **Section 7.8**.).

**Table 4-17: Feedback Received via Consultation to Inform Existing Environment Description**

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| BTAC representing some of the Gnulli native title claimants (Baiyungu and Thalanyji people) | Raised specific to PAP (See Appendix F; Table 1)<br>Raised in context of general Scarborough Project activities | Value: Cultural obligation to care for the environmental values of Sea Country<br>Sea Country extends *"out to the vast islands off the coast of the Pilbara, including the Monte Bello Islands, Barrow Island, and the Mackerel Islands"* | Possible (unspecified)<br>No (refer to further description below) | Possible (unspecified)<br>No (refer to further description below) |
| Murujuga Aboriginal Corporation representing Ngarda-Ngarli people (Mardudhunera, Ngarluma, Wong-Goo-Tt-Oo, Yaburara and Yindjibarndi) | Raised in context of Nearshore Scarborough Project activities | Value: Mermaid Sound – Ecosystem health | No | No |
| | | Feature: Whale<br>Value: A whale Thalu is an increase at a totemic site that brings whales into beach<br>Value: Whales and other species of totemic importance need to be protected, including their populations, biodiversity, and migration patterns<br>Value: Whales are culturally important species that migrate through Mermaid Sound. Humpback whales in particular | Likely to occur (**Table 4-7)**<br>Possible (unspecified)<br>Likely to occur<br>May occur | Known to occur (**Table 4-7)**<br>Possible (unspecified)<br>Known to occur<br>Known to occur |
| | | Feature: Dolphins<br>Value: There are cultural ceremonies associated with communicating with dolphins | May occur<br>Possible (unspecified) | May occur<br>Possible (unspecified) |
| | | Feature: Dugongs<br>Value: Dugongs are a food source associated with seagrasses near Gidley Island | No (Appendix C)<br>No (Appendix C) | No (Appendix C)<br>No (Appendix C) |
| | | Feature: Fish<br>Value: There are Thalu ceremonies associated with increasing fish stocks | Known to occur<br>Possible (unspecified) | Known to occur<br>Possible (unspecified) |
| | | Feature: Sea snakes<br>Specifically mentioned as culturally important species | May occur (Appendix C) | May occur (Appendix C) |
| | | Feature: Flatback, green, hawksbill, loggerhead and leatherback turtles | Likely to occur (turtles; **Table 4-6**) | Known to occur (turtles; **Table 4-6**) |

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | | Turtles are culturally important species that moves through Mermaid Sound. Turtles are most often seen in shallower areas and where there are seagrasses<br>Most beaches are nesting sites for turtles, including those on Gidley and Legendre Islands<br>Value: The songline associated with the turtle comes from Fortescue to Withnell Bay. This song is sung by four or five tribes for day and night without consuming food or water | No<br>No<br>No (songline geographically restricted nearshore) | No<br>No<br>No (songline geographically restricted nearshore) |
| | | Interest: Coral<br>Fish are attracted to areas with coral<br>Concerned about coral bleaching because corals are important. Beautiful colours. They also attract a lot of other things<br>Fish carry coral spawn like bees pollinate flowers. If fish were looked after, the corals would get brighter and brighter (by transmitting nutrients and performing other ecosystem services, fish can be symbiotic with corals)<br>Spawning events should be avoided (associated with full moon).<br>Locations identified during consultation include Withnell Bay; Conzinc Bay; south west of Legendre Island | No (Table 4-4) | No (Table 4-4) |
| | | Feature: Seagrass<br>Seagrasses provide protection for animals<br>Locations identified during consultation include Conzinc Island; between Angel and Gidley Island. | No (Table 4-4) | No (Table 4-4) |
| | | Value: Mangroves would have provided shelter, crabbing, digging for shellfish, could be turtle nurseries<br>Locations identified during consultation include Conzinc Bay north end; Flying Foam Passage; | No (Table 4-4) | No (Table 4-4) |

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | | Searipple Passage; north-east bay of West Lewis Island | | |
| | | Interest: Macroalgal communities, which are important primary production sites, habitats, and food sources (not explicitly identified by elders) | No (Table 4-4) | No (Table 4-4) |
| | | Interest: Subtidal soft-bottom communities, which support invertebrate diversity (not explicitly identified by elders) | No (Table 4-4) | No (Table 4-4) |
| | | Interest: Intertidal sand and mudflat communities, which are important primary production sites, support invertebrate diversity and provide food for shorebirds (not explicitly identified by elders) | No | No |
| | | Interest: Rocky shores, which are habitats for intertidal organisms and provide food for shorebirds (not explicitly identified by elders) | No | No |
| | | Feature: Fish traps | No | No |
| | | There are known fish traps in Conzinc Bay, and others would have or do exist in coastal areas of islands, such as Angel and Gidley Islands. People still use the Conzinc Bay fish traps regularly for catching mangrove jack, trevally and other fish | No | No |
| | | Value: Squidding (harvesting of squid from the ocean) around Conzinc Island | No | No |
| Ngarluma Aboriginal Corporation (NAC) | No values raised | - | - | - |
| Ngarluma Yindjibarndi Foundation Limited (NYFL) | No values raised | - | - | - |
| Nganhurra Thanardi Garrbu Aboriginal Corporation | Raised specific to PAP (See Appendix F; Table 1)<br>Raised in context of general Scarborough Project activities | Interest: Whales - query regarding noise impacts, monitoring and operational responses to whale sightings | Likely to occur (whale; **Table 4-7**) | Known to occur (whale; **Table 4-7**) |

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| representing Baiyungu and Thalanyji people | Raised in context of decommissioning activities | Interest: Whale sharks – query regarding activity timing<br><br>Interest: Marine parks – query regarding risks from activity in relation to decommissioning | No<br><br>No | Known to occur (Table 4-5)<br>Yes (Gascoyne AMP) |
| Robe River Kuruma Aboriginal Corporation (RRKAC) | Raised in context of general Scarborough Project activities | Feature: Underwater heritage | No (feature restricted to Ancient Landscape) | No (feature restricted to Ancient Landscape) |
| Save Our Songlines, [redacted] and [redacted] | Raised specific to PAP (See Appendix F; Table 1)<br>Raised in context of general Scarborough Project activities | Feature: Songlines, dreaming and energy lines (unspecified) | Possible (unspecified) | Possible (unspecified) |
| | | Feature: Whales – including migratory patterns | Likely to occur (**Table 4-7**) | Known to occur (**Table 4-7)** |
| | | Interest: Turtles – including migration patterns | Likely to occur (**Table 4-6**) | Known to occur (**Table 4-6**) |
| | | Interest: Dugongs – unspecified | No (Appendix C) | No (Appendix C) |
| | | Interest: Plankton – unspecified | Known to occur | Known to occur |
| | | Interest: Seagrass – Unspecified | No (Table 4-4) | No (Table 4-4) |
| | | Interest: Where saltwater and freshwater meet | No | No |
| | Raised in Concise Statement and Affidavit[6] in context of Scarborough seismic activities[7] | Value: Caring for Country<br>[redacted] asserts holders of women's lore with cultural obligations to protect, preserve and promote the environment, animals and plants threatened by the Activity (specific to Seismic)<br>[redacted] asserts the spiritual health and wellbeing of Murujuga and all the plants and animals present on Murujuga and connected to the songlines in and around Murujuga | Possible (unspecified) | Possible (unspecified) |

[6] https://www.fedcourt.gov.au/__data/assets/pdf_file/0003/112278/6-Applicants-Concise-Statement.pdf
[7] Information from publicly available sources to support consultation with SOS, [redacted] and [redacted]

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | | Feature: Whales<br>[redacted] asserts the following values:<br>“Whales carry important songlines, the whale Dreaming, and connection between land and sea”<br>"As the biggest animal on earth, the whale has the greatest heart connection to songlines, people and animals and carries the songlines around the ocean, connecting places."<br>“Whale Dreaming story has a strong connection to the heart centre in each person, this story helps people to open up and to realise, understand and raise awareness of the environment and everything humans are connected to.”<br>"In their own families, female whales have a caretaker or midwife role, and those who are connected to the Whale Dreaming and carry the women's lore also have obligations as caretakers of the earth."<br>"The women's lore that [redacted] and [redacted] carry is the songline of the whale, which is important for sustaining the creation of all animals and humans."<br>'[redacted] and [redacted] connect to the whales like this through their songlines, they sing to the whales, the whales feel that song and the connection through their hearts, regardless of the distance."<br>"the whales tell [redacted] and [redacted] a story, and [redacted] and [redacted] are the people who feel and who are connected to that story. [redacted] and [redacted] have that feeling of connection inside them all the time, they live and breathe it, they are in and everything about it."<br>"Because each animal uses songlines for migration, breeding and feeding, the disruption or | Likely to occur (whale; **Table 4-7**)<br>Possible (songlines, unspecified) | Known to occur (whale; **Table 4-7**)<br>Possible (songlines, unspecified) |

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | | distortion to the songlines causes the animals to become disoriented, confused or lost.” | | |
| | | Interest: Whales<br>Interest: Pygmy Blue whales<br>“Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to<br>ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales<br>iii. whales' sonar communications systems, particularly between mothers and calves, from sound and vibrations emitted by the Activity<br>v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon); and<br>vi. vehicle collision and/ or entanglement with marine fauna" | Likely to occur (**Table 4-7**) | Known to occur (**Table 4-7**) |
| | | Interest: Turtles<br>"Other animals, such as turtles, dolphins, dugongs, and krill follow the whale's songlines, because they're all connected together - the whale creates a path for the other animals like 'grading a road'."<br>“Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:<br>ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales | Likely to occur (**Table 4-6**) | Known to occur (**Table 4-6**) |

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | | v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon); and<br>vi. vehicle collision and/ or entanglement with marine fauna" | | |
| | | Interest: Dugongs<br>“Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:<br>v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon)” | No (Appendix C) | No (Appendix C) |
| | | Interest: Pelagic fish<br>“Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:<br>ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales” | Known to occur | Known to occur |
| | | Interest: Sharks<br>“Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:<br>ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales | Likely to occur (Table 4-6**)** | Likely to occur (Table 4-6**)** |

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | | v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon)" | | |
| | | Interest: Plankton<br>"Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:<br>i. chronic mortality to some marine organisms, including zooplankton | Known to occur | Known to occur |
| | | Interest: Water quality<br>"Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:<br>iv. potential operational discharges associated with the presence of ships in the area, including potential impacts to water quality<br>v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon) | Yes | Yes |
| | | Interest: Seabirds<br>"Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:<br>v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon) | May occur (**Table 4-9**) | May occur (**Table 4-9**) |

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | | Value: Where saltwater and freshwater meet<br>"The places where the saltwater from the sea and the freshwater from the land connect are where the biggest energy lines[8] are, and that connection is a core of creation relevant to a Dreaming story." | No | No |
| | | Value: Rock Art<br>"Rocks at Murujuga symbolise stories, the totems (the depicted artwork) - whether representing plants or animals - and tell a story of their history, and how long they've been there." | No | No |
| | | Value: Bungarra, Eagle, Kangaroo<br>Identified totemic species | No | No |
| | | Value: Murujuga<br>"When [redacted] and [redacted] and their people stand on Country they are connected to their songlines through the rocks. As holders of women's lore, [redacted] and [redacted] put healing energy into the rocks and use that to heal the songlines."<br>"[redacted] and [redacted] connect to their bloodline, old people and songlines through Country, including the rocks at Murujuga, which are encrypted with ancient stories that keep connection to the bloodline and songlines alive and well." | No | No |
| Wirrawandi Aboriginal Corporation representing Ngarda-Ngarli (Mardudhunera and Yaburara) | Raised in context of general Scarborough Project activities | Interest: Whales - query with regard to whale migration and timing of Project activities; impact of noise on whale communication<br>Interest: Turtles - query with regard to turtle monitoring programs<br>Interest: Underwater heritage – query with regard to where sites have been recently found | Likely to occur (**Table 4-7**)<br>Likely to occur (**Table 4-6**)<br>No | Known to occur (**Table 4-7**)<br>Known to occur (**Table 4-6)**<br>No |

[redacted] and Save our Songlines have referred to and described Energy Lines which Woodside Interprets to be the same as Songlines. This document will refer to songlines from this point forward.

| Relevant First Nations Group /Individuals | Consultation context | Description of Feature and Value / Interest | Potential for overlap | |
|---|---|---|---|---|
| | | | PAA | EMBA |
| | Raised in context of decommissioning activities | Interest: Rock Art – query whether air emissions from activities impacts rock art and controls to minimise potential impacts | No | No |
| Yamatji Marlpa Aboriginal Corporation (YMAC) | No values raised | - | - | - |
| Yindjibarndi Aboriginal Corporation | No values raised | - | - | - |
| Yinggarda Aboriginal Corporation representing Yinggarda People. | Raised in context to Scarborough project activities. | Interest: Whales – query with regard to potential impacts to whale migration patterns and impacts from vessel collision | Likely to occur (**Table 4-7**) | Known to occur (**Table 4-7**) |
| | | Value: Shark Bay Mullet – important resource | No (coastal species) | No (coastal species) |
| | | Interest: Dugong – raised in context of Shark Bay | No | No |
| | | Interest: Seagrass being food source for Dugong | No (Table 4-4**)** | No (Table 4-4**)** |

### *Further Information regarding BTAC's Sea Country values*

During consultation, BTAC, on behalf of the Thalanyji People, advised it has a cultural obligation to care for the environmental values of Sea Country (refer to Appendix F, Table 1).

In correspondence from 20 February 2023 relating to the Scarborough Project, BTAC advised that:

- BTAC seeks support from Woodside to enable BTAC to define and articulate its values on Sea Country in a manner that could be more clearly understood by the offshore sector, government, and the community. This would enable BTAC and Woodside to collaborate to develop effective management plans that can provide adequate protection to Sea Country values; and
- BTAC seeks support from Woodside to obtain technical support to review the information and provide BTAC and its members with feedback on the project risks to Sea Country and help BTAC contemplate the potential management controls that could be developed to protects its values and interests

Woodside has agreed to BTAC's request, and the resulting offer of technical support is detailed in Appendix F, Table 1. However, Woodside's offer for technical support has not yet been accepted.

BTAC noted that this Sea Country extends "out to the vast islands off the coast of the Pilbara, including the Monte Bello Islands, Barrow Island, and the Mackerel Islands." In the absence of further advice from BTAC, Woodside understands from this description that BTAC's interests extend to the Montebello Marine Park Multiple Use Zone in the vicinity of the islands.

While an ethnographic survey has not been requested, a review of publicly available literature has been undertaken to seek clarity on the extent of Sea Country for Thalanyji people. This review identified a number of heritage research projects undertaken for the Montebello and Barrow Islands which acknowledge the support of BTAC (e.g. Manne and Veth 2015, Veth et al. 2017), though no information regarding Sea Country values, or the extent of Sea Country, were identified.

Publicly available heritage assessment reports elsewhere on Thalanyji Country tend to rely on established native title boundaries (e.g. Chisholm 2013) or draw on historic maps, particularly those compiled by Norman Tindale and published in 1947 (e.g. Archae-aus 2020). An early 1940's map by Tindale shows "Ṫalaindji" (Thalanyji) Country as exclusively terrestrial and further west than areas typically recognised today as Thalanyji Country (Tindale 1940). This map also shows the Noala people as custodians of the Onslow area and defines Barrow and the Montebello Islands as "Mardudunera" (Mardudhunera) Country—it is unclear from the map if the boundary of Mardudhunera is proposed to represent an extent of Sea Country, or merely note that these islands are part of Mardudhunera Country. A further refined version of this map was produced in 1974 which shows "Talandji" in a location more closely aligned with contemporary understanding of Thalanyji Country and removes the apparent extent of Mardudhunera over Barrow and the Montebello Islands (Tindale 1947). This definition of Thalanyji Country is still confined to the mainland in this map. A more contemporary attempt at mapping traditional Country is shown in The AIATSIS Map of Indigenous Australia (Horton 1996). This map similarly confines Thalanyji Country to terrestrial areas west of Onslow and leaves Barrow and the Montebello Islands unmarked as an area with "No published information available". It is also noted that "This map is based on data collected up to 1994 and is not intended to show precise areas or boundaries" (Horton 1996).

Collective assessments of Sea Country in the Pilbara (Lincoln and Hedge 2019, YMAC et al. 2010) were also found to rely on existing native title boundaries. It is noted in the Pilbara Sea Country Plan (YMAC et al. 2010) that:

> *Although some differences remain, between and among native title groups, there is now a general sense that most groups have coalesced into final forms that will, in future, be the groups that exercise rights and interests in their respective areas. many of these rights and interests will relate directly to native title. however, there is also a more broadly based*

> *appreciation of the need to accept and discharge responsibilities for land and marine management within native title areas regardless of whether native title per se is affected.* (YMAC et al. 2010, emphasis added).

The office of the Registrar of Indigenous Corporations records four corporations using the name Thalanyji:

- Buurabalayji Thalanyji Aboriginal Corporation
- Buurabalayji Thalanyji Aboriginal Corporation RNTBC
- Onslow Thalanyji Aboriginal Corporation
- Wurrumalu Thalanyji Aboriginal Corporation

The only currently operative organisation, and the only organisation with an identifiable website, is Buurabalayji Thalanyji Aboriginal Corporation RNTBC. This website states that "Thalanyji Country spreads out across the Ashburton River coastal plain south to Tubridji Point, then across to Yannarie River and upstream to Emu Creek, across the range hills of southwest Pilbara to Henry River and Cane River in the north" (BTAC 2021https://thalanyji.com.au/). This description includes coastal areas but provides no description of the extent of Sea Country.

A search of the National Native Title Tribunal register of applications and determinations identified four historic Native Title claims with the name Thalanyji:

- Thalanyji People (WC1995/002)
- Thalanyji People #2 (WC1996/082)
- Thalanyji (WC1999/045)
- Thalanyji 2 (WC2010/004)

Most of these claims were dismissed, and Woodside makes no assessment of the merits of these claims.

The area of WC1995/002, as defined in the map forming Attachment 1 to the Native Title Application[9], does not include any areas of Sea Country. WC1996/082 does not include a publicly available map on the National Native Title Tribunal website. The Native Title Application[10] does describe the area covered by the claim, including "This country extends from the Tubridji Point on the coast south west of Onslow and tracking south to Yanarrie River." and "The area also includes the waters and associated islands between Tubridji point and Cane River. These islands were visited by Thalanyji People." The extent of this Sea Country from the coast is unclear, but would presumably include islands as distant as Airlie Island, approximately 30 km from the shore.

The area of WC1999/045, as defined in the map forming Attachment C to the Native Title Application[11], includes an area of water extending approximately 30 km from the mainland coast in encompassing a number of islands, including Airlie Island, Ashburton Island, Bessieres Island, Direction Island, Flat Island, Locker Island, Round Island, Serrurier Island, Table Island, Thevenard Island, Tortoise Island, and the Twin Islands. The area also includes the south-most of the Mangrove Islands, but does not include the other Mangrove Islands.

[9] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC1995_002/Attachment%20A-%20Thalanyji%20Map.pdf
[10] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC1996_082/SNTAExtract_WC1996_082.pdf
[11] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC1999_045/1999_11_09%20Attachment%20B%20Map%20of%20Claim%20Area.pdf

The area of WC2010/004, as defined in the map forming Attachment C to the Native Title Application[12] includes localised areas of sea up to approximately 5 km beyond the coast.

In none of these applications do the extent of asserted interests extend to Barrow, Mackerel or the Montebello Islands. The furthest extent of a claim is the approximate 30 km margin extended from the mainland coast for WC1999/045. If this margin is precautionarily applied to the coasts of the Montebello Islands (as the closest islands to the operational area which were identified by BTAC in defining their Sea Country) this would not exceed beyond the Montebello Multiple Use Zone within the vicinity of the islands.

In summary, the publicly available information considered in this section does not record any instances of Thalanyji Sea Country extending beyond the Montebello Multiple Use Zone within the vicinity of the islands. The Montebello Islands, Barrow Island or the Mackerel Islands or the Montebello Marine Park Multiple Use Zone, or the islands indicated in WC1999/045 are outside of the PAA and EMBA for the activity.

Woodside has developed a robust understanding of Thalanyji Sea Country cultural values and heritage features through publicly available information (**Section 4.9.1.5.1**) and consultation with BTAC under Regulation 11A. Woodside considers that it has taken all reasonable steps to identify cultural features and heritage values of Thalanyji people in the EMBA.

If further guidance from BTAC is received as part of ongoing consultation which changes Woodside's understanding of the extent of Thalanyji Sea Country, Woodside's Management of Change and Management of Knowledge process with EPO 28 will be applied to manage potential impact to newly identified cultural values or features to ALARP and Acceptable levels. This estimation does not limit the extent of consultation with BTAC or the features and values they are encouraged to identify and communicate.

### 4.9.1.6 Summary of cultural features and heritage values

Woodside has developed a robust understanding of cultural features and heritage values relevant to the activity through examination of publicly available information, studies and consultation with relevant persons under Regulation 11A.

**Table 4-18** consolidates the cultural features and heritage values identified in **Section 4.9.1.5** and confirms whether there is any potential for these to exist within the PAA or EMBA. It also includes topics which have been raised in the context of an interest linked to the natural environment are impact and risk assessed in **Section 6.7** and **6.8**.

As cultural features are physical elements of a place, these can generally be assessed for impacts; where a feature is avoided, it is not impacted. Heritage values relate less to what is significant and more to why something is significant; interaction between heritage values and the PAA can only be reliably informed by consultation with Traditional Custodians where they are willing to share the necessary knowledge. Assessment of heritage values beyond cultural features alone is addressed in **Section 6.10** subject to these caveats.

[12] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC2010_004/WC2010_004%202.%20Map%20of%20Application%20Area.pdf

**Table 4-18 Summary of cultural features and heritage values**

| Identified cultural features and heritage values (including interests) | Context | EP Source | | | | Potential for overlap | |
|---|---|---|---|---|---|---|---|
| | | ***Consultation Feedback*** | ***First Nations Archaeological Heritage Assessment*** | ***Ethnographic Heritage Assessment*** | ***Desktop Literature Assessment*** | ***PAA*** | ***EMBA*** |
| ***Archaeological heritage*** | | | | | | | |
| None identified – refer to **Section 4.9.1.6.1**<br>No archaeological sites have been identified beyond terrestrial or intertidal areas, with the exception of two sites at Murujuga outside the EMBA, specifically in Cape Bruguieres channel and Flying Foam Passage (Benjamin et al. 2020; Benjamin et al 2023). While it is recognised that there is the potential for submerged archaeological sites on the Ancient Landscape as noted in **Table 4-17**, both the PAA and EMBA do not overlap the Ancient Landscape. | | | | | | | |
| ***Intangible values*** | | | | | | | |
| Songlines | Ethnographic survey noted dreaming tracks from locations onshore and to islands outside of the EMBA, but was not able to determine the routes of any dreaming tracks that may extend across the submerged landscape. | ✓ | X | ✓ | ✓ | Possible (unspecified) | Possible (unspecified) |
| Creation/ dreaming sites, sacred sites and ancestral beings | Ethnographic survey noted some sites associated with creation/dreaming or ancestral beings are known on land outside the EMBA.<br>Publicly available literature talks to creation/dreaming and ancestral beings, including water serpents, connected to or originating from the sea generally, but cannot be confirmed to relate to features within the EMBA. | ✓ | X | ✓ | ✓ | Possible (unspecified) | Possible (unspecified) |
| Cultural obligations to care for Country | Cultural obligation to care for the environmental values of Sea Country. Exclusion of Traditional Custodians from Sea Country or decision making processes may inhibit ability to care for Country. | ✓ | X | X | ✓ | Possible (unspecified) | Possible (unspecified) |

| Identified cultural features and heritage values (including interests) | Context | EP Source | | | | Potential for overlap | |
|---|---|---|---|---|---|---|---|
| | | ***Consultation Feedback*** | ***First Nations Archaeological Heritage Assessment*** | ***Ethnographic Heritage Assessment*** | ***Desktop Literature Assessment*** | ***PAA*** | ***EMBA*** |
| Knowledge of Country/ customary law and transfer of knowledge | The preservation and transmission of knowledge is dependent on the preservation of the environment generally.<br>Exclusion of Traditional Custodians from Sea Country may inhibit the transfer of knowledge. | ✓ | X | ✓ | ✓ | Possible (unspecified) | Possible (unspecified) |
| Connection to Country | Connection to Country may be damaged where people are displaced or disrupted (e.g. during colonisation) or where there is a loss of technical skills or environmental knowledge | ✓ | X | X | ✓ | Possible (unspecified) | Possible (unspecified) |
| Access to Country | Limitations on Traditional Custodians accessing or enjoying areas of Sea Country | ✓ | X | X | ✓ | Possible (unspecified) | No (No limitations on access beyond the PAA) |
| Kinship systems and totemic species | Traditional Custodians have connection to species through kinship and totemic systems.<br>An individual may have obligation to care for or not consume a species to which they are kin. | ✓ | X | X | ✓ | Possible (unspecified) | Possible (unspecified) |
| Resource collection | Fishing, hunting, gathering of marine species | ✓ | X | X | ✓ | No | Possible (unspecified) |
| ***Marine ecosystems and species*** | | | | | | | |
| Marine species | Generally raised in consultation and literature | ✓ | X | X | ✓ | Yes | Yes |

| Identified cultural features and heritage values (including interests) | Context | EP Source | | | | Potential for overlap | |
|---|---|---|---|---|---|---|---|
| | | ***Consultation Feedback*** | ***First Nations Archaeological Heritage Assessment*** | ***Ethnographic Heritage Assessment*** | ***Desktop Literature Assessment*** | ***PAA*** | ***EMBA*** |
| Whales | Generally raised in consultation<br>Thalu species of totemic importance<br>Linked to songlines and dreaming stories<br>Humpback whales in particular | ✓ | X | X | ✓ | Likely to occur (whales; **Table 4-7**) | Known to occur (whales; **Table 4-7**) |
| Dolphins | Cultural ceremonies associated with communicating with dolphins | ✓ | X | X | X | May occur | May occur |
| Marine turtles | Culturally important species and migration<br>Turtles and turtle eggs as a resource<br>Law run through the sea, including turtles | ✓ | X | X | ✓ | Likely to occur (turtles; **Table 4-6**) | Known to occur (turtles; **Table 4-6)** |
| Sea snakes | Culturally important species | ✓ | X | X | X | Possible | Possible |
| Fish (including sharks and rays) | Culturally important species<br>Fish as a resource<br>Law run through the sea, including fish<br>There are Thalu ceremonies associated with increasing fish stocks | ✓ | X | X | ✓ | Known to occur | Known to occur |
| Seabirds | Interest only, raised as a natural environment interest as a potential impacted receptor of impacts to water quality | ✓ | X | X | X | May occur | May occur |
| Plankton | Interest only, raised as a natural environment interest | ✓ | X | X | X | Yes | Yes |
| Water quality | Interest only, raised as a natural environment interest | ✓ | X | X | X | Yes | Yes |
| Subtidal soft-bottom communities | Interest only, raised as a natural environment interest regarding invertebrate diversity | ✓ | X | X | X | Yes | Yes |

| Identified cultural features and heritage values (including interests) | Context | EP Source | | | | Potential for overlap | |
|---|---|---|---|---|---|---|---|
| | | ***Consultation Feedback*** | ***First Nations Archaeological Heritage Assessment*** | ***Ethnographic Heritage Assessment*** | ***Desktop Literature Assessment*** | ***PAA*** | ***EMBA*** |
| Marine Park | Interest only; raised in context of decommissioning activities | ✓ | X | X | X | No | Yes |

#### 4.9.1.6.1 Further context: Intangible cultural heritage

Intangible cultural heritage have been identified through consultation with First Nations people as culturally important (refer to **Section 4.9.1**). Cultural knowledge, as expressed through songlines, dreaming, dance and other cultural practices, can be associated with tangible objects and physical sites that are culturally important to First Nations people (Adler 2021; Bursill et al. 2007). Intangible cultural heritage can also be embodied in the practices, representations, expressions, knowledge, uses and skills associated with physical sites (UNESCO 2003). As a result, physical features may have intangible dimensions (ICOMOS 2013).

##### *Songlines*

Oral Songlines are often described by First Nations people as the law of the land and make up part of the Dreaming (Neale and Kelly 2020:30). Songlines are viewed in Western academia as a framework for relating people to land and consist of a series of invisible, interconnected routes across the landscape that mark significant sites for First Nations people (Higgins 2021:723). Songlines demonstrate First Nations peoples' strong connections to land by revealing sacred knowledge that is place-specific (Roberts 2023:5). The land's physical features are instrumental in maintaining songlines because this is how ancestral spirits journeyed through, and interacted with, the physical landscape leaving sacred knowledge behind. The interconnection between the physical and spiritual is where songlines become intrinsically tied to significant places across Country. As a result, geographical landforms are recorded within songlines and become sacred places. Such landforms can include inter alia: rocks, mountains, rivers, caves and hills (Higgins 2021:724). Songlines can become lost, fragmented or broken when there is a loss of Country or forced removal from Country (Neale and Kelly 2020:30). Physical sites that have been identified as comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge.

In Australia, songlines can stretch thousands of kilometres, making up a complex and organic network of stories containing cultural knowledge of First Nations communities across the land (Neale and Kelly 2020:35). Songlines can also extend out to Sea Country and contain cultural knowledge that is tied to geographic features, atmospheric phenomena and marine plants and animals. Often songlines containing references to a seascape or Sea Country make mention of mythical events occurring around marine life, fishing areas, submerged rocks or coral. Songlines that embody seascapes can reflect how a group may relate to, or value, Sea Country—for example connections to nearby islands that they once inhabited in their songlines (Smyth and Isherwood 2016:307). Songlines can also be used as proof of long-standing connection to land and support a legal entitlement to land rights (Higgins 2021:74). Examples where songlines contain strong references to Sea Country are more common in Pacific Islander and Torres Strait Islander communities, who often refer to seascapes and skylines in their songlines in order to communicate sacred knowledge that assists in safe navigation of the ocean (Neale and Kelly 2020:83-84).

The routes of any songlines in the EMBA have not been provided by Traditional Custodians through consultation.

##### *Creation/dreaming sites, sacred sites and ancestral beings*

The only sources located by Woodside with detailed descriptions of the location ancestral beings or creation/dreaming/sacred sites placed these on land or within inland water sources such as rivers or pools. However, some ancestral beings are noted to live within or originate from the sea generally, and some creation stories talk to the creation of features from or in the sea. Additionally, every place on shore or at sea must be assumed to have been created on some level in First Nations cosmology.

### *Cultural obligations to care for Country*

Caring for Country collectively refers to the cultural obligations of individuals and groups, as well as rituals and ceremonies required for the physical and spiritual health of the environment. In the literature reviewed by Woodside, caring for Country was noted to include, but is not limited to, maintenance of the physical environment and ecosystem. It may also have cultural, spiritual and ritual dimensions such as caring for ancestral beings or ensuring cultural safety. Thalu are places where increase ceremonies are performed to enhance or maintain populations of plants, animals or phenomena. All mentions of active ceremonial sites were confined to onshore locations, though the values may extend offshore where e.g., a thalu relates to marine species populations.

### *Knowledge of Country/customary law and transfer of knowledge*

Knowledge of and familiarity with the features of Sea Country is itself a value. The inherent potential for restricted or secret knowledge makes this difficult to assess even through consultation with Traditional Custodians. However, aspects such as limitations on access to sites or disruption/relocation of First Nations communities may have implications for the preservation of First Nations knowledge. Further, connection to Country may be damaged where people are displaced or disrupted (e.g., during colonisation) or where there is a loss of technical skills or environmental knowledge (McDonald and Phillips, 2021).

Transfer of knowledge includes continuing traditional practices to pass on practical skills. This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003).

### *Connection to Country*

Connection to Country describes the multi-faceted relationship between First nations people and the landscape, which is envisioned as having personhood and spirit. It is also an aspect of personal identity for many First nations people. In the case of Sea Country this can mean identifying as a Saltwater person, where "essence of being a 'Saltwater' person is ontological… it is about how people relate spiritually to the sea and engage with spiritual forces that created it, the marine flora and fauna and people" (McDonald and Phillips, 2021).

### *Access to Country*

Access to Country, including Sea Country, is necessary for the continuation of other values including caring for Country and the transfer of traditional knowledge. Being on Country can be an important way of expressing or maintaining connection to Country (Australian Indigenous HealthInfoNet n.d.). Access is also a value in its own right, as a continuation of traditional Sea Country access and use.

### *Kinship systems and totemic species*

Individuals may have kinship to specific species (Smyth 2008, Juluwarlu 2004) and/or a responsibility to care for species (Muller 2008). Kinship arises from totemic associations within First Nations "skin group" systems. It is forbidden for an individual to kill or eat a species who is from the same "skin group" (Juluwarlu 2004). They may also have certain obligations linked to the discussion of caring for Country below. It is assumed that marine species may have kinship/totemic relationships to Traditional Custodians, but it is understood that these relationships do not prohibit people outside of that "skin group" from hunting or eating that same species (Juluwarlu 2004).

### *Resource collection*

A number of marine species are identified through consultation and literature as important resources, particularly as food sources. In addition to their immediate value as sustenance, the gathering and

preparation of these resources are informed by cultural knowledge, and an inability to use these resources may result in a loss of ability to transfer that knowledge to future generations.

#### 4.9.1.6.2 Further context: Marine ecosystems and species

### *Marine mammals*

Whales, and in particular humpback whales, have been identified through consultation with First Nations people as culturally important species, with totemic importance including their populations, biodiversity, and migration patterns. Cultural ceremonies associated with communicating with dolphins have also been raised by MAC through consultation.

Whale symbology expressed through stories, music, and dance can reflect a group's connections with the sea, as well as marine fauna, which then comprise a group's cultural values (Ardler 2023; Bursill et al. 2007; Cressey 1998). Whales also speak to a broader connection that exists between First Nation people and their surrounding environment. Beyond mythology and symbolism, whales can be connected with various economic and social functions associated with everyday life. Cultural knowledge of whales, whale migration, behaviour and the related marine environment may all be important in ensuring the continuation of these socio-economic functions and other related activities that remain valuable to First Nations people (Fijn 2021:47).

Details pertaining to whales and dolphins, their distribution, migration patterns and populations are described in **Section 4.6.3**, with further details in **Appendix I** (Master Existing Environment).

### *Marine reptiles*

Turtles and sea snakes have been identified through consultation with First Nations people as culturally important species, with turtles identified as a resource. First Nations people that identify marine reptiles as species of totemic importance or integral to songlines may place high cultural value on their protection. No marine reptiles -related songlines have been identified as per Section 4.9.1.6.1 that have the potential to interact with the PAA or EMBA. Note the only songline related to marine reptiles (turtles) was shared by MAC, and was geographically restricted from Fortescue to Withnell Bay, in Mermaid Sound (MAC 2021).

Turtle symbology expressed through stories, music, and dance can reflect an individual or group's connections with the sea, as well as marine fauna, and comprise First Nations' cultural values (Ardler 2023; Bursill et al. 2007). Beyond mythology and symbolism, turtles can be connected with various economic and social functions associated with everyday life including hunting and settlement location. Turtles speak to a broader connection that exists between First Nation people and their surrounding environment, including cultural values associated with food security (Delisle et al.2018:250).

Cultural knowledge of turtles at a population level (turtle migration, behaviour and the related marine environment) may all be important in ensuring the continuation of cultural functions and activities that remain valuable to First Nations people (Fijn 2021:47; Delisle et al.2018). Details pertaining to marine reptiles, their distribution, and populations are described in **Section 4.6.2**, with further details in **Appendix I** (Master Existing Environment).

### *Fish*

Fish have been identified through consultation with First Nations people as a culturally important species, with fish generally being identified as a resource.

First Nations may identify cultural values associated with fish species as important to maintaining both tangible (physical cultural sites) and intangible (cultural knowledge) cultural heritage. Tangible cultural heritage associated with fish can include important cultural sites such as midden sites, fish traps and thalu sites. Traditional fish traps require traditional knowledge of the surrounding

environment and may involve specialised techniques which have been developed in adaptation to location conditions over time (Fijn 2021:63).

Intangible cultural heritage associated with fish include songlines, dreaming, art, song and dance. Cultural values relating to fish, and other marine fauna, can collectively capture 'Sea Country' which refers to a seascape that Traditional Custodians view, interact with or hold knowledge of. As a result, fish may be culturally value in relationship with broader marine environmental values that are of cultural importance to First Nations people (Smyth 2007).

Details pertaining to fish, sharks and rays are described in **Section 4.6.1**, with further details in **Appendix I** (Master Existing Environment).

#### *Natural environment interests*

First Nations people have advised through consultation that they have a general interest in environmental management and ecosystem health, including understanding changes in water quality as a result of the Petroleum Activities Program and potential resultant affects on marine species and benthic communities in the PAA and EMBA. This includes marine mammals, marine reptiles, fish, seabirds, plankton and subtidal soft bottom communities, which are described in context of their distribution and populations in **Section 4.6**, with further details in **Appendix I** (Master Existing Environment).

### 4.9.2 Heritage Listed Places

No listed world, national or commonwealth heritage places overlap the PAA or EMBA.

A search of the Australasian Underwater Cultural Heritage, which records all known Maritime Cultural Heritage (shipwrecks, aircraft, relics and other underwater cultural heritage) in Australian waters indicated that there are no underwater heritage sites or shipwrecks within the PAA or EMBA.

### 4.9.3 Commercial Fisheries

A number of Commonwealth and State fishery management areas are located within the PAA and EMBA. The Annual Fishery Status Reports published by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) were used to identify if Commonwealth managed fisheries that have fished within the Operational Area in the last 5 years. FishCube data were also requested from the WA Department of Primary Industries and Regional Development (DPIRD) for the most recently available 5-year period of fishery catch and effort data (2018-2022) to analyse the potential for interaction with State managed fisheries within the Operational Area (DPIRD, 2022). Data from Fishcube and ABARES was reviewed from the last 5 years as a subset of past fishing effort. This was deemed an appropriate period to represent potential future fishing effort over the lifecycle of this EP (5 years). In addition, any impacts to fish are expected to be temporary in nature (See **Section 6.1** and **Section 6.2**) and therefore not extending beyond the life of the EP. **Table 4-16** provides an assessment of the potential interaction and **Appendix I** provides further detail on the fisheries that have been identified through desk-based assessment and consultation (**Section 5**). No fisheries were identified as having a potential interaction with the Petroleum Activities Program.

**Table 4-16: Commonwealth and State commercial fisheries overlapping the PAA and EMBA**

| Fishery | Potential for interaction<br>× no potential for interaction<br>✓ potential for interaction | | |
|---|---|---|---|
| | **Overlap with PAA** | **Overlap with EMBA** | **Description** |
| ***Commonwealth Managed Fisheries*** | | | |
| North West Slope Trawl Fishery | × | ✓ | The North West Slope Trawl Fishery management area overlaps the combined EMBA. Between one to six vessels have been active in the fishery since 2005. Fishery Status Reports indicate most recent activity inside the EMBA occurred in the 2020-2021 season (ABARES, 2021).<br>Accordingly, Woodside considers it a possibility that interactions with the fishery may occur in the combined EMBA. |
| Western Deepwater Trawl Fishery | × | ✓ | The Western Deepwater Trawl Fishery overlaps the PAA and EMBA.<br>Fishery Status Reports indicate most recent activity overlapping the EMBA occurred in the 2020-2021 season (ABARES, 2021).<br>Accordingly, Woodside considers it a possibility that interactions with the fishery may occur in the combined EMBA. |
| Southern Bluefin Tuna Fishery | × | × | The Southern Bluefin Tuna Fishery spans the Australian Fishing Zone, however since 1992, the majority of Australian catch has concentrated in south-eastern Australia. (ABARES, 2021).<br>Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program. |
| Western Skipjack Tuna Fishery | × | × | The Western Skipjack Tuna Fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. The Fishery is not currently active and no fishing has occurred since 2009 (ABARES, 2021). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program. |
| Western Tuna and Billfish Fishery | × | × | The Western Tuna and Billfish Fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. However, in the last five years (2016 – 2021), fishing effort has concentrated south of Carnarvon (ABARE., 2021).<br>Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program. |
| ***State Managed Fisheries*** | | | |
| West Coast Deep Sea Crustacean Managed Fishery | × | ✓ | The West Coast Deep Sea Crustacean Managed Fishery is permitted to fish in waters deeper than the 150 m isobath, overlapping the PAA and EMBA. The fishery is active in the EMBA with two 60NM CAES blocks overlapping the EMBA reported less than 3 vessels in the 2021 – 2022 seasons (DPIRD, 2022).<br>FishCube data reported no fishing effort at 10 NM CAES blocks in the last five years overlapping the PAA (DPIRD, 2022). Woodside considers there to be potential for interaction with the fishery in the EMBA. |
| Pilbara Line Fishery | × | ✓ | The Pilbara Line Fishery licensees are permitted to operate anywhere within Pilbara waters (Newman et al., 2021), overlapping the PAA and EMBA. The fishery is active in the EMBA, with one 60 NM Catch and Effort System (CAES) block reporting up to four licences across the 2017 – 2022 seasons (DPIRD, 2022). FishCube data for the Pilbara Line Fishery is not provided at the 10 NM scale, however effort reported in the 60 NM CAES block does not overlap |

| Fishery | Potential for interaction<br>× no potential for interaction<br>✓ potential for interaction | | |
|---|---|---|---|
| | **Overlap with PAA** | **Overlap with EMBA** | **Description** |
| | | | with the PAA. Therefore, Woodside considers it a possibility that interactions with the fishery may occur only in the EMBA. |
| Mackerel Managed Fishery (Areas 2 and 3) | × | ✓ | The Mackerel Managed Fishery overlaps the PAA and EMBA. FishCube data reported active fishing by up to three vessels in one CAES block between the 2017 – 2022 seasons (DPIRD, 2022). FishCube data reported no fishing effort at 10 NM CAES blocks in the last five years overlapping the PAA (DPIRD, 2022). Woodside considers there to be potential for interaction with the fishery in the EMBA. |
| Marine Aquarium Managed Fishery | × | ✓ | The Marine Aquarium Fish Managed Fishery management area overlaps the PAA and the EMBA, however generally collects fish for display in water depths of less than 30 m. The fishery is active in the EMBA, with one 60 NM CAES block reporting less than three licences across the 2017 – 2021 seasons (DPIRD, 2022). FishCube data reported no active fisheries at 10 NM CAES block overlapping the PAA (DPIRD, 2022). Therefore, Woodside considers it a possibility that interactions with the fishery may occur in the EMBA. |
| South West Coast Salmon Managed Fishery | × | × | The South West Coast Salmon Fishery management area overlaps the EMBA. However, FishCube data reported no fishing effort within the PAA or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program. |
| Pilbara Crab Managed Fishery | × | × | The Pilbara Crab Managed Fishery management area overlaps the PAA and the EMBA. However, FishCube data reported no fishing effort within the PAA or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program. |
| West Coast Rock Lobster Fishery | × | × | The Western Rock Lobster Fishery management area overlaps the EMBA (DPIRD 2022). However, FishCube data reported no fishing effort within the PAA or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program. |
| Pearl Oyster Managed Fishery | × | × | The Pearl Oyster Managed Fishery management area overlaps the EMBA. However, FishCube data reported no fishing effort within the PAA or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program. |
| ***Charter based commercial operators*** | | | |
| Tour Operators | × | ✓ | Fishing Tour Operators are permitted to operate across WA state waters and are required to report monthly logbook records of client fish catches. FishCube data reports consistent fishing effort across three 60 NM CAES blocks that overlap the EMBA (DPIRD, 2022). Fishing effort was reported by up to 17 vessels across the 2017 – 2022 seasons (DPIRD, 2022).<br>FishCube data reported no active tour operators at 10 NM CAES blocks overlapping the PAA (DPIRD, 2022). FishCube data indicate tour operator fishing effort highest around Ningaloo and Murion Islands and at Barrow Island and the Montebello Islands, east of the |

| Fishery | Potential for interaction<br>× no potential for interaction<br>✓ potential for interaction | | |
|---|---|---|---|
| | Overlap with PAA | Overlap with EMBA | Description |
| | | | EMBA. Accordingly, Woodside considers it a possibility that interactions with tour operators will occur within the EMBA. |

### 4.9.4 Traditional Fisheries

There are no identified traditional or customary fisheries within the offshore waters of the PAA and EMBA, as these are typically restricted to shallow coastal waters and/or areas with structure such as reef.

### 4.9.5 Tourism and Recreation

From a regional perspective, recreation and tourism activities within the NWMR are of high social value. The majority of tourism and recreation activities occur on land and within State waters. Recreational and tourism activities include charter fishing, other recreational fishing, diving, snorkelling, whale, whale shark, marine turtle and dolphin watching, cruise ship stop-overs and yachting.

The PAA is 215 km from Exmouth and 216 km from the Muiron Islands, while these locations are the closest areas with regular tourism and recreation activities, they are both located outside of the EMBA. Tourism and recreation activity within the PAA, socio-cultural EMBA and EMBA is therefore not expected.

### 4.9.6 Commercial Shipping

The Australian Maritime Safety Authority (AMSA) has introduced a network of marine fairways across the NWMR off WA to reduce the risk of vessel collisions with offshore infrastructure. It is noted that none of these fairways intersect with the PAA; the nearest fairway is approximately 38 km east of the PAA (**Figure 4-11**). Vessel tracking data suggest the majority of shipping is concentrated to the east of the PAA, which is likely associated with ports.

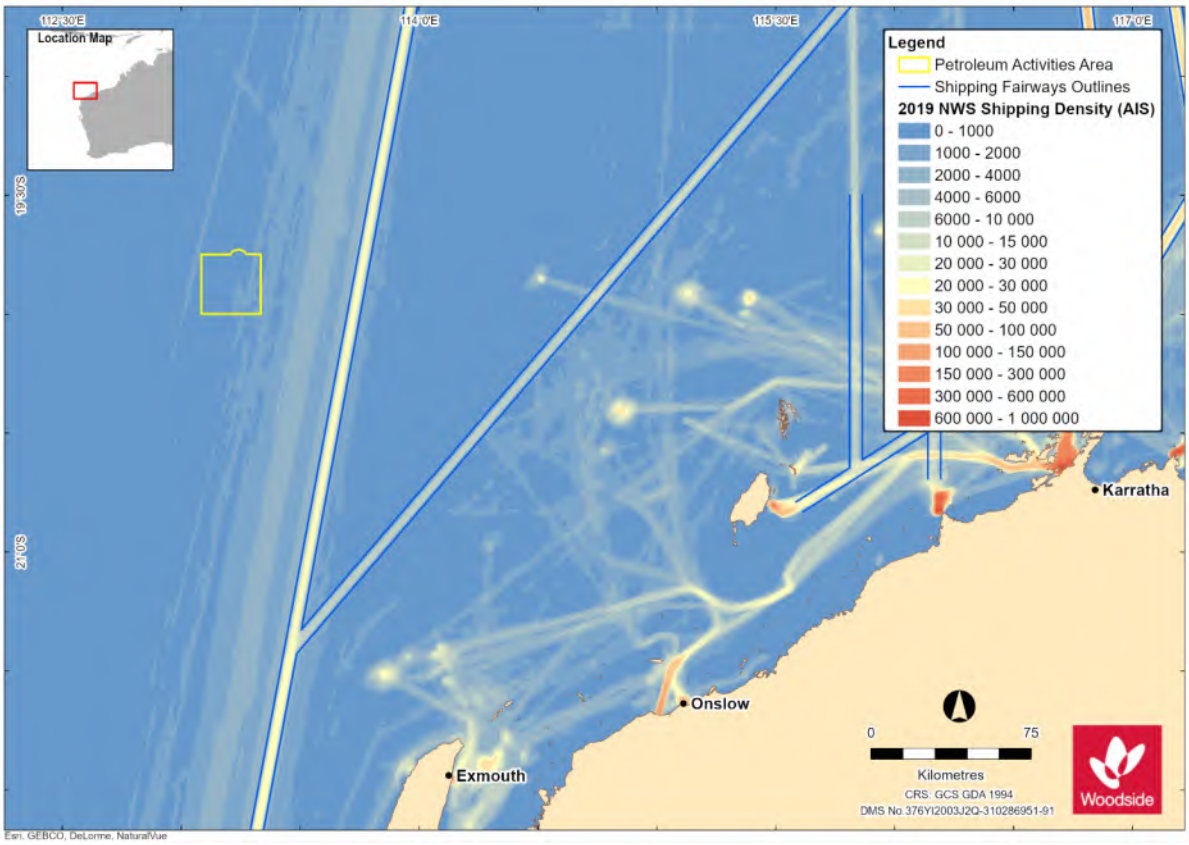



**Figure 4-11: Vessel density map for the PAA, derived from AMSA satellite tracking system data**

*(vessels include cargo, LNG tanker, passenger vessels, support vessels, and others/unnamed vessels)*

### 4.9.7 Defence

There are designated Department of Defence practice areas in the offshore marine waters off Ningaloo Reef and the North West Cape, associated with the Royal Australian Air Force base located at Learmonth, of which a military flying training area partially overlaps the PAA **Figure 4-12.**

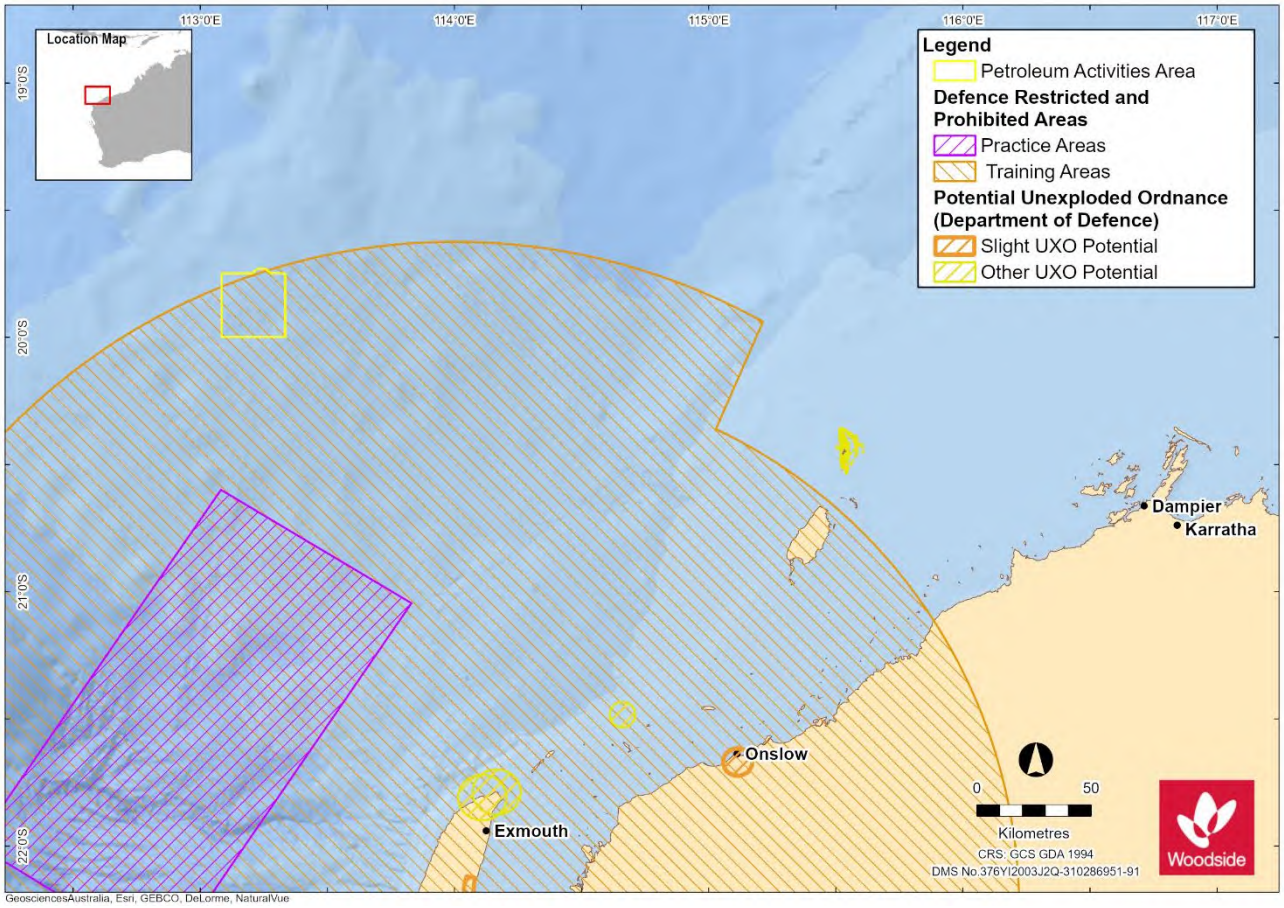



**Figure 4-12: Defence training areas relative to the PAA**

### 4.9.8 Oil and Gas

The PAA is located in the Exmouth Plateau area of the Northern Carnarvon Basin. No subsea infrastructure is present in the PAA or WA-61-L permit (there are no wellheads above the seabed).

There are a number of petroleum titles held by various titles within the vicinity of the Petroleum Activities Program, but currently no oil and gas facilities. The proposed Equus Development Project is located about 70 km east of the PAA, within the EMBA. The closest facilities, the Pluto and Wheatstone platforms, are located outside the EMBA.

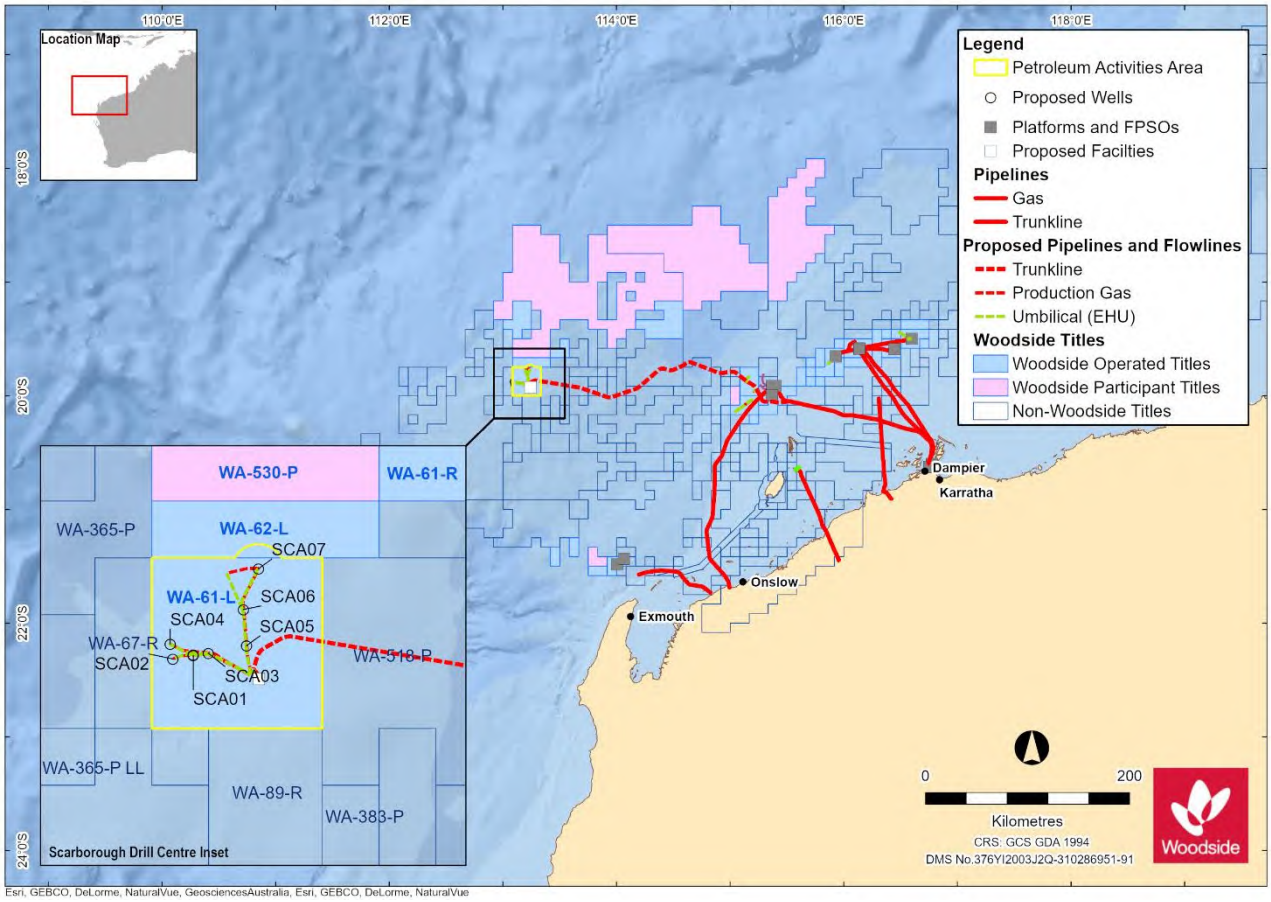



**Figure 4-13: Oil and gas titles and infrastructure within the region**

# 5 CONSULTATION

## 5.1 Summary

Woodside consults relevant persons in the course of preparing an Environment Plan in accordance with regulation 11A of the Environment Regulations. Woodside acknowledges that consultation is designed to ensure that relevant persons are identified and given sufficient information and a reasonable period to allow them to make an informed assessment of the possible consequences of the proposed activity on them and, to ensure that titleholders can consider and adopt appropriate measures in response to the matters raised by relevant persons. Consistent with regulation 3 of the Environment Regulations, consultation also supports Woodside's objective to ensure that the environmental impacts and risks of the activity are reduced to ALARP and an acceptable level.

Woodside acknowledges that a titleholder's approach to consultation must be informed by both the Environment Regulations and the findings of the Full Federal Court in the *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 (Tipakalippa Appeal) (see **Section 5.2** and **5.5.1**) delivered on 2 December 2022.

For this PAP, Woodside has considered both the Operational Area and the broader EMBA (environment may be affected) in undertaking consultation (see further discussion in **Section 5.2**). The broadest extent of the EMBA has been determined by reference to the highly unlikely event of a hydrocarbon release resulting from the PAP (see **Section 4**).

Woodside's consultation methodology is divided into three parts:

- The first section (**Section 5.2** to **5.7**) provides an overview of Woodside's consultation methodology for its Environment Plans, including how we apply regulation 11A(1) of the Environment Regulations to identify relevant persons.
- The second section **(Section 5.8)** explains Woodside's application of the consultation methodology and Woodside's assessment of relevant persons for this Environment Plan.
- The third section **(Section 5.9)** details the:
  - Opportunities provided to persons or organisations to be aware of Woodside's proposed Environment Plan and to participate in consultation, including individual Traditional Custodians.
  - Consultation information provided to relevant persons, feedback received and Woodside's assessment of the merits of objections or claims.
  - Engagement with persons or organisations that Woodside chose to contact who are not relevant persons for the purposes of regulation 11A(1) of the Environment Regulations (see **Section 5.3.4**).

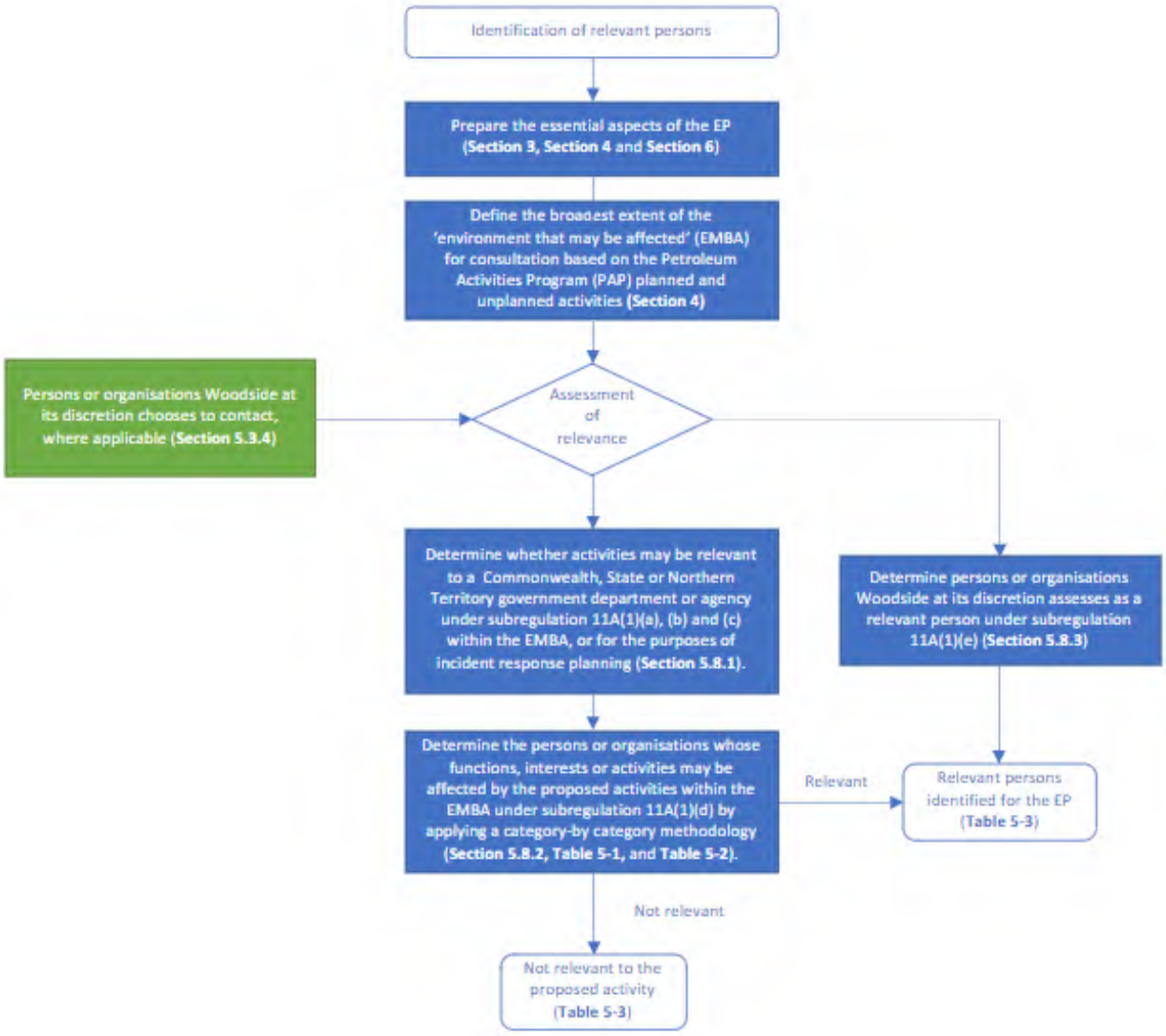



**Figure 5-1: Overview of Woodside's methodology to identify relevant persons**

## 5.2 Consultation – General Context

Woodside has a portfolio of quality oil and gas assets and more than 30 years of operating experience. We have a strong history of working with local communities, the relevant regulators and a broad range of persons and organisations to understand the potential risks and impacts from our proposed activities and to develop appropriate measures to manage them.

The length of time that we have operated in Commonwealth and State waters, and the history of continued engagement with a wide range of persons and organisations, enables Woodside to develop an extensive consultation list to inform its consultation process. This consultation list is not used as a definitive list of persons to consult, but rather, assists Woodside as an input to its understanding of relevant persons with whom to consult on a proposed petroleum activity. The information in the consultation list has been captured from years of experience, it contains insights relating to the type of information particular persons or organisations want to receive during consultation, the appropriate method of consultation for relevant persons, and includes appropriate contact details, which are reviewed and updated periodically.

Woodside acknowledges NOPSEMA's guideline on *Consultation in the course of preparing an environment plan* (12 May 2023) as well as recent judicial guidance in the Tipakalippa Appeal on the intent of consultation as follows:

- At paragraph 54 of the appeal decision: *… provide a basis for NOPSEMA's considerations of the measures, if any, that a titleholder proposes to take or has taken to lessen or avoid the deleterious effect of its proposed activity on the environment, as expansively defined*.
- At paragraph 89 of the appeal decision: …*its purpose is to ensure that the titleholder has ascertained, understood and addressed all the environmental impacts and risks that might arise from its proposed activity. Consultation facilitates this outcome because it gives the titleholder an opportunity to receive information that it might not otherwise have received from others affected by its proposed activity. Consultation enables the titleholder to better understand how others with an objective stake in the environment in which it proposes to pursue the activity perceive those environmental impacts and risks. As the Regulations expressly contemplate, it enables the titleholder to refine or change the measures it proposes to address those impacts and risks by taking into account the information acquired through the consultations. Objectively, the scheme intends that this is likely to improve the minimisation of environmental impacts and risks from the activity.*

The Tipakalippa Appeal has also been further considered in the context of specific methods for consultation with First Nations relevant persons (**Section 5.5.1**).

In order to undertake consultation, Woodside has developed a methodology for identifying relevant persons, in accordance with regulation 11A(1) of the Environment Regulations (**Section 5.3**). This methodology reflects NOPSEMA's recent guideline and demonstrates that, in order to meet the requirements of regulation 10A (criteria for Environment Plan acceptance) when preparing the Environment Plan, Woodside understands:

- our planned activities in the Operational Area, being the area in which our planned activities are proposed to occur (see **Section 3.5**); and
- the geographical extent to which the EMBA by risks and impacts from our activities (unplanned) (identified in **Section 4.1** and assessed in **Section 6.8**).

Woodside has undertaken consultation in the course of preparing this Environment Plan in compliance with regulation 11A of the Environment Regulations, which requires a titleholder to:

- consult with each of the following (a ***relevant person***) in the course of preparing an Environment Plan:
  - each Department or agency of the Commonwealth to which the activities to be carried out under the Environment Plan, or the revision of the Environment Plan, may be relevant;
  - each Department or agency of a State or the Northern Territory to which the activities to be carried out under the Environment Plan, or the revision of the Environment Plan, may be relevant;
  - the Department of the responsible State Minister, or the responsible Northern Territory Minister;
  - a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the Environment Plan, or the revision of the Environment Plan; and
  - any other person or organisation that the titleholder considers relevant (regulation 11A(1).

- give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on their functions, interests or activities (regulation 11A(1)(2));
- allow a relevant person a reasonable period for the consultation (regulation 11A(1)(3)); and
- tell each relevant person that the titleholder consults with, that the relevant person may request that particular information it provides in the consultation not be published and any information subject to such a request is not to be published (regulation 11A(1)(4)).

Further, Woodside seeks to carry out consultation in a manner that:

- is consistent with the principles of ecologically sustainable development (ESD) set out in section 3A of the EPBC Act – see **Section 2**;
- is intended to reduce the environmental impacts and risks from the activity to ALARP and an acceptable level;
- seeks to ensure that the environmental impacts and risks of the activity will be of an acceptable level;
- is intended to minimise harm to the relevant person and the environment from the proposed petroleum activities and to enable Woodside to consider measures that may be taken to mitigate the potential adverse environmental impacts that the petroleum activity may otherwise cause;
- is collaborative; Woodside respects that for a relevant person, consultation is voluntary. Where the relevant person seeks to engage, Woodside collaborates with the relevant person with the aim of seeking genuine and meaningful two-way dialogue; and
- provides opportunities for relevant persons to provide feedback throughout the life of the Environment Plan through its ongoing consultation process (refer to **Section 5.7** and **Section 7.11**).

An overview of Woodside's consultation approach is outlined at **Figure 5-2:**

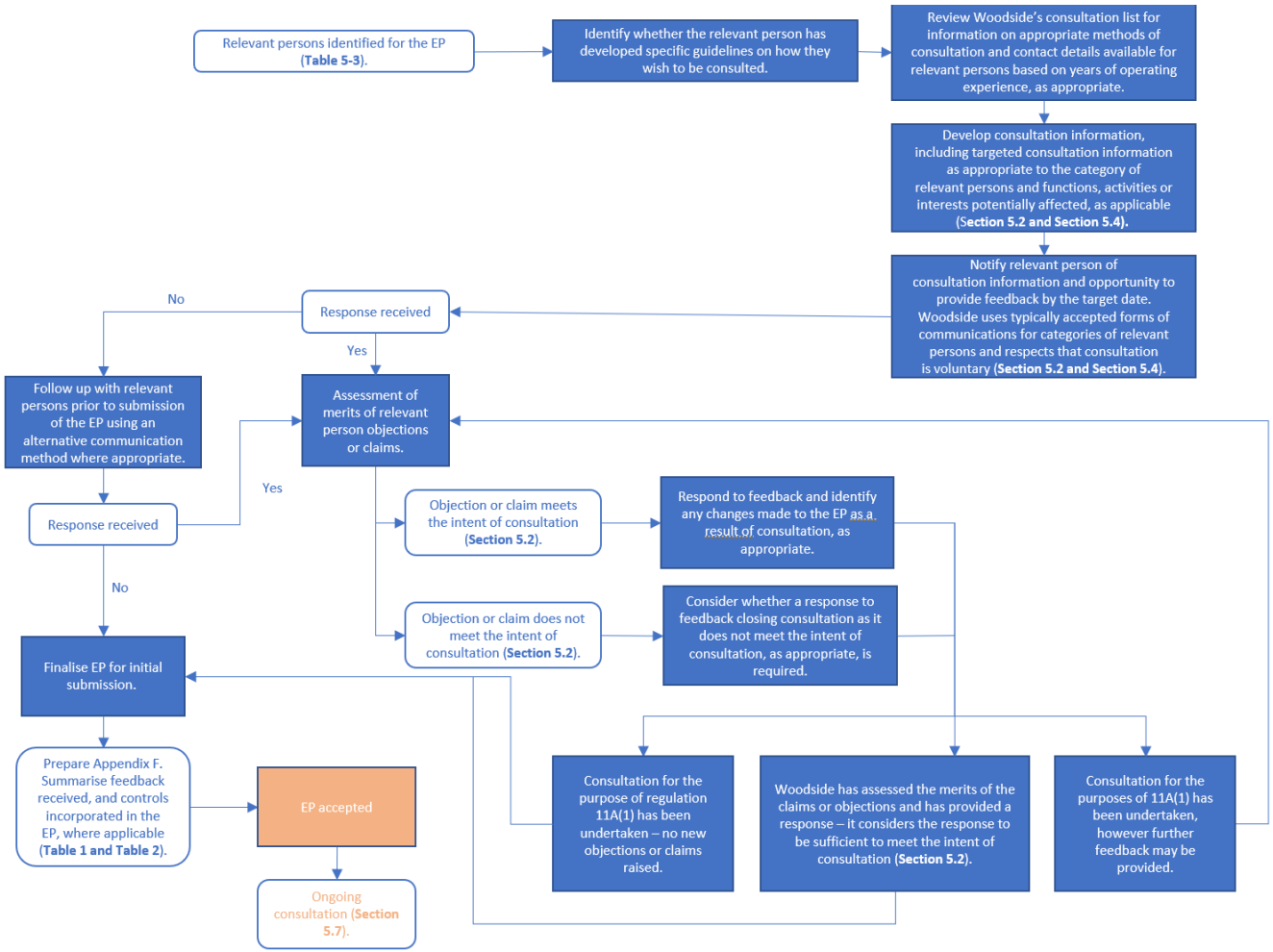



**Figure 5-2: Overview of Woodside's consultation approach**.

The methodology for consultation for this activity has been informed by various guidelines and relevant information for consultation on planned activities, including:

Federal Court:

- Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193

NOPSEMA:

- GL2086 – Consultation in the course of preparing an environment plan – May 2023
- GN1847 - Responding to public comment on environment plans - July 2022
- GN1344 - Environment plan content requirements - September 2020
- GL1721 - Environment plan Decision Making Guideline - December 2022
- GN1488 - Oil pollution risk management - July 2021
- GN1785 – Petroleum activities and Australian Marine Parks – June 2023
- GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023
- PL2098 – Draft Policy for managing gender-restricted information
- Consultation on offshore petroleum environment plans – Information for the community

Department of Climate Change, Energy, the Environment and Water:

- Sea Countries of the North-West; Literature review on Indigenous connection to and uses of the North West Marine Region

Australian Fisheries Management Authority:

- Petroleum industry consultation with the commercial fishing industry

Commonwealth Department of Agriculture and Water Resources:

- Fisheries and the Environment – Offshore Petroleum and Greenhouse Gas Act 2006
- Offshore Installations Biosecurity Guide

WA Department of Primary Industries and Regional Development:

- Guidance statement for oil and gas industry consultation with the Department of Fisheries

WA Department of Transport:

- Offshore Petroleum Industry Guidance Note

Good practice consultation:

- IAP2 Public Participation Spectrum
- Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Act 1999

## 5.3 Identification of Relevant Persons for Consultation

### 5.3.1 Regulations 11A(1)(a), (b) and (c)

The relevant inquiry for determining relevant persons within the description of regulations 11A(1)(a) and (b) is whether the activities to be carried out under the Environment Plan may be relevant to one of the government departments or agencies in those regulations. These government departments and agencies are listed in **Table 5-3** below. In accordance with regulation 11A(1)(c), Woodside

consults with the department of the relevant State Minister, which for this Environment Plan is the Department of Mines, Industry Regulation and Safety (DMIRS).

### 5.3.2 Regulation 11A(1)(d)

In order to identify a relevant person for the purposes of regulation 11A(1)(d), the meaning of "functions, interests or activities" needs to be understood. In regulation 11A(1)(d), the phrase "functions, interests or activities" should be construed broadly and consistently with the objects of the Environment Regulations (regulation 3) and the objects of the EPBC Act (section 3A).

In developing its methodology for consultation, Woodside acknowledges that the guidance on the definition of functions, interests and activities is as follows in accordance with NOPSEMA's *GL2086 – Consultation in the course of preparing an environment plan* guideline (May 2023):

| | |
|---|---|
| **Functions** | Refers to a power or duty to do something. |
| **Interests** | Conforms to the accepted concept of 'interest' in other areas of public administrative law and includes any interest possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation. |
| **Activities** | Broader than the definition of 'activity' in Regulation 4 of the Environment Regulations and is likely to be directed to what the relevant person is already doing. |

As discussed in **Section 5.1** and **Section 5.2**, Woodside's methodology for determining 'relevant persons' for the purpose of regulation 11A(1)(d) of the Environment Regulations includes consideration of:

- whether a person or organisation has functions interests or activities that overlap with the Operational Area and EMBA; and
- whether a person or organisation's functions, interests or activities may be affected by Woodside's proposed planned or unplanned activities.

### 5.3.3 Regulation 11A(1)(e)

In addition to assessing relevance under regulation11 A(1)(d), Woodside has discretion to categorise any other person or organisation as a relevant person under regulation11A(1)(e).

### 5.3.4 Persons or Organisations Woodside Chooses to Contact

In addition to undertaking consultation with relevant persons under regulation11A(1) there are persons or organisations that Woodside chooses to contact, from time to time, in relation to a proposed activity. For example, these are persons or organisations:

- that are 'not relevant' pursuant to regulation 11A(1) but that Woodside has chosen to seek additional guidance from, for example, to inform the correct contact person that Woodside should consult, or engage with;
- that are 'not relevant' pursuant to regulation 11A(1) but have been contacted as a result of consultation requirements changing or updated guidance from the Regulator; and
- where it is unclear what their functions, interests or activities are, or whether their functions, interests or activities may be affected. In this circumstance, engagement is required to inform relevance under Woodside's methodology. Woodside follows the same methodology for assessing a person or organisation's relevance as it does during its initial assessment (as described in **Figure 5-1** and **Section 5.8**). The result of

Woodside's assessment of relevance during the development of the Environment Plan is outlined at **Table 5-3**.

Engagement undertaken with persons or organisations Woodside assessed as not relevant but chose to contact are summarised at **Appendix F, Table 2**.

## 5.4 Consultation Material and Timing

Regulation 11A(2) provides that a titleholder must give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person. Regulation 11A(3) provides that the titleholder must allow a relevant person a reasonable period for the consultation.

As set out in **Section 5.2**, Woodside notifies relevant persons, of the proposed activities, respecting that consultation is voluntary (for the relevant person) and collaborates on a consultation approach where further engagement is sought by the relevant person. Woodside understands that the consultation process should be appropriate for the category of relevant persons and that not all persons or organisations will require the same level of engagement. Woodside recognises that the level of engagement is dependent on the nature and scale of the PAP. Woodside recognises published guidance for good practice consultation relevant to different sectors and disciplines (see 5.2). Woodside's methodology for providing relevant persons with sufficient information as well as a reasonable period of time to provide feedback is set out in this section.

### 5.4.1 Sufficient Information

Woodside produces a Consultation Information Sheet for each Environment Plan (**Appendix F, reference 1.1 and 1.25**). This is provided to relevant persons and organisations and is also available on Woodside's website for interested parties to access and to provide feedback on. The Consultation Information Sheet typically includes a description of the proposed petroleum activity, the Operational Area where the activity will take place, the timing and duration of the activity, a location map of the Operational Area and EMBA, a description of the EMBA, relevant exclusion zones, as well as a summary of relevant risks and mitigation and/or management control measures relevant to the proposed petroleum activity. It also sets out contact details to provide feedback to Woodside.

Woodside recognises that the level of information necessary to assist a person or organisation to understand the impacts of the proposed activity on their functions, interests or activities may vary and, also may depend on the degree to which a relevant person is affected. For example, Woodside considers that relevant persons who may be impacted by planned activities in the Operational Area, for example as a result of temporary displacement due to exclusion zones, may require more targeted information relevant to their functions, interests or activities. Woodside also acknowledges NOPSEMA's brochure entitled *Consultation on offshore petroleum environment plans information for the community*, which advises consultees that they may inform titleholders that they only want to be consulted in the very unlikely event of an oil spill.

Woodside places advertisements in a selected local, state and national newspaper. This typically includes the name of the Environment Plan Woodside is seeking feedback on, an overview of the activity, the consultation feedback date, and the ways in which a person or organisation can provide feedback. Advertising in the local paper in the area of the activity is also consistent with the public notification process under section 66 of the *Native Title Act* for native title applications. Woodside typically aligns advertisement feedback timeframes with the timing described below. Feedback received is assessed in accordance with **Section 5.8** to determine relevance and evidenced in Appendix F, Table 1 as appropriate.

Woodside utilises a range of tools to provide sufficient information to relevant persons, which may include one or more of the following:

- Consultation Information Sheet available on Woodside's website (**Appendix F, reference 1.1 and 1.25**);

- Summary Consultation Information Sheet, presentations or summaries specific to a particular relevant person group (**Appendix F, reference 1.26 and 1.27**);
- subscription (available on Woodside's website) to receive notification of new Consultation Information Sheets for Woodside Environment Plans;
- emails;
- letters;
- phone calls;
- face-to-face meetings (virtual or in person) with presentation slides or handouts as appropriate;
- maps outlining a persons or organisations defined area of responsibility in relation to the proposed activity, for example a fisheries management area or defence training area; and
- community meetings, as appropriate.

Woodside recognises that information may need to be provided to relevant persons in an iterative manner during the consultation process. Woodside considers that in line with the intent of consultation (see **Section 5.2**), the threshold for genuine two-way engagement is met via information on incorporation of controls, where applicable, being provided to the relevant person to ensure the relevant persons understand how their input has been considered in the development of the Environment Plan.

Woodside communicates with relevant persons in different ways. Woodside recognises that as part of genuine two-way dialogue, these forms of communication may evolve, including for example due to changes to organisation representation, as relationships are further established, or an alternative form of communication is expressed by a person or organisation. Woodside acknowledges that there might be limitations in how it can consult with relevant persons.

Typical forms of communications for categories of relevant persons are set out below.

| Category of relevant person | Typically accepted form of communication |
|---|---|
| **Government departments / agencies – marine**<br>**Government departments / agencies – environment**<br>**Government departments / agencies – industry** | Woodside applies NOPSEMA's guideline for engagement with Commonwealth government departments or agencies in line with *GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023* by using email for its consultation unless another form of communication is requested.<br><br>Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request. |
| **Commercial fisheries and peak representative bodies**<br>**Recreational marine users and peak representative bodies** | **Commonwealth commercial fisheries:** Email is used as the primary form of communication with Commonwealth commercial fisheries in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.<br><br>**State commercial fisheries and recreational marine users:** The Western Australian Department of Primary Industries and Regional Development (DPIRD) has responsibility for managing the *Fish Resources Management Act 1994* and *Aquatic Resources Management Act 2016*, which limits the provision of contact details from the register to the name and business address of licence holders. Alternative forms of communication are at the licence holder's discretion. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.<br><br>**Peak representative bodies:** Email is used as the primary form of communication with commercial fishery and recreational marine user peak representative bodies in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. |

| Category of relevant person | Typically accepted form of communication |
|---|---|
| **Titleholders and Operators** | Email is used as the primary form of communication between titleholders and operators in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. |
| **Peak industry representative bodies** | Email is used as the primary form of communication with peak representative bodies in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. |
| **Traditional Custodians and nominated representative corporations** | The forms of communication that Woodside engages in are often bespoke and applied on a case-by-case basis and as appropriate to, or as requested by the specific group, such as email, phone calls, meetings and community forums. Other forms of communication are used where requested. |
| **Native Title Representative Bodies** | The forms of communication that Woodside engages in are often bespoke and applied on a case-by-case basis and as appropriate to the specific group, such as email, phone calls, meetings and community forums. Other forms of communication are used where requested. |
| **Historical heritage groups or organisations** | NOPSEMA's guideline (*GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023*) for engagement with government departments or agencies is used as a reference for Woodside's approach for communicating with historical heritage groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. |
| **Local government and recognised local community reference/liaison groups or organisations** | **Local government:** NOPSEMA's guideline (*GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023*) for engagement with local government is used as a reference for Woodside's approach for communicating with historical heritage groups or organisations.<br>**Community reference/liaison groups and chambers of commerce:** Email is used as the primary form of communication with local community reference/liaison groups or organisations in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. |
| **Other non-government groups or organisations** | Email is used as the primary form of communication with Other non-government groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. |
| **Research Institutes and Local conservation groups or organisations** | Email is used as the primary form of communication with research institutes and local conservation groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. |

Information which is provided to relevant persons for the purposes of consultation on this Environment Plan is summarised at **Appendix F, Table 1.**

**Appendix F, Table 2** sets out the information which is provided to persons or organisations that are not relevant for the purposes of regulation 11A but which Woodside has chosen to contact (see **Section 5.3.4**).

When engaging in consultation, Woodside notifies relevant persons that, in accordance with regulation 11A(4), the relevant person may request that particular information the person or organisation provides in the consultation not be published and that information subject to that request will not be published.

### 5.4.2 Reasonable Period for Consultation

Woodside seeks to consult in order to support preparation of its Environment Plan. Woodside recognises that what constitutes a reasonable period for consultation should be considered on a case-by-case basis, with reference to the nature, scale and complexity of the activity.

Woodside recognises that information may need to be provided to relevant persons in an iterative manner during the consultation process. Woodside considers that in line with the intent of consultation (see **Section 5.2**), the threshold for genuine two-way engagement is met via engagement on incorporation of controls, where applicable, being provided to the relevant person so that the relevant person understands how their input has been considered in the development of the Environment Plan.

Woodside has allowed a reasonable period for relevant persons, including Traditional Custodian relevant persons, to participate in consultation for this Environment Plan. The consultation period for this Environment Plan exceeds 250 days, from the date of first advertising consultation on this Environment Plan in October 2022, to the date of submission of this Environment Plan, being October 2023.

The consultation period under this Environment Plan greatly exceeds benchmark periods under other relevant legislative processes:

- Consultation under Regulation 11B of the Regulations sets out a public consultation period of 30 days.
- The Department of Mines and Petroleum "*Guidelines for Consultation with Indigenous People by Mineral Explorers*" directs a period of 21- 30 days of consultation with traditional owners.
- Guidance taken from the Aboriginal Cultural Heritage Act 2021—Consultation Guidelines (Government of Western Australia, 2023) suggests that up to 12 weeks may be a reasonable period of time to allow identification, contact, and response, from First Nations peoples (subject to any alternative timeframe being agreed through co-design of consultation).

This extended period of consultation demonstrates that Woodside has provided a "reasonable period" for consultation in accordance with regulation 11A(3). Commentary in the *Tipakalippa Appeal* judgment limits consultation to a process that must be capable of being discharged within a reasonable time:

*"it must be taken to be the regulatory intention that the consultation requirement cannot be one that is incapable of being complied with within a reasonable time..."*[13]

Woodside seeks feedback in order to support preparation of its Environment Plan. What constitutes a reasonable period for consultation is considered on a case-by-case basis, with reference to the person being consulted and the nature, scale and complexity of the activity. Woodside's typical approach is as follows:

- advertising in selected local, state and national newspapers (**see Appendix F, reference 1.89**) to give persons or organisations the opportunity to understand the activity and identify whether their functions, interests or activities may be affected;
- providing consultation materials directly to identified relevant persons as well as persons who are not relevant but Woodside chose to contact (see **Section 5.3.4**), and providing a target date for feedback. Woodside acknowledges that feedback may be received from relevant persons following the target date;
- acknowledging that the way in which Woodside provides consultation information may vary depending on the relevant person or organisation and, may depend on the degree to which a relevant person or organisation is affected. Different consultation processes may be required for relevant persons and organisations depending on the information requirements;

[13] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [136].

- following up with relevant persons prior to Environment Plan submission. Where possible, Woodside will endeavour to use an alternative method of communication to contact the relevant person; and
- engaging in two-way dialogue with relevant persons or organisations where feedback is received.

**Appendix F, Table 1 and Table 2** sets out a history of consultation and demonstrates that a reasonable period of consultation has been afforded for each relevant person.

Woodside considers that the "reasonable period" of consultation for this Environment Plan has been provided and the consultation under regulation 11A is complete.

As detailed in **Section 5.7** and **Section 7.11**, if comments and feedback are received after the Environment Plan has been submitted, Woodside will consider those comments and update controls as appropriate, at all stages during the life of the Environment Plan, as per Woodside's ongoing consultation approach.

## 5.5 Context of Consultation Approach with First Nations

To comply with regulation 11A, Woodside identifies and consults Traditional Custodians whose functions, interests or activities may be affected by the activities under an Environment Plan.

### 5.5.1 Approach to Methodology − Woodside's Interpretation of Tipakalippa

Woodside has implemented a consultation methodology consistent with regulation 11A and guidance provided in the Tipakalippa Appeal (**Section 5.2**). Woodside's consultation methodology allows for a sufficiently broad capture of Traditional Custodian relevant persons, provides for informed consultation, follows cultural protocols and allows a reasonable opportunity for consultation with Traditional Custodians whose functions, interests and activities may be affected by the activity described in this Environment Plan (**Section 5.5.2.1 to 5.5.2.4).**

Woodside notes the Full Federal Court discussed several *Native Title Act 1993* (Cth) (**NTA**) cases in response to a submission made in that case that a requirement under regulation 11A to consult "each and every" relevant person would be "unworkable". The reference to native title cases dealt with how decision-making processes under the NTA requiring "all" members of a group to be contacted for communal approval are interpreted by courts in a "reasonable", "pragmatic" and "not so literal" way,[14] and how obligations to consult "each and every" person under regulation 11A should be interpreted in a similarly pragmatic way so that consultation is workable. The reference to NTA authorities was made by analogy:

> "*It can be seen that the terms of [the native title legislation] are somewhat absolute – "all". However, [the native title legislation] has consistently been construed in a way that is not so literal … The cases concerning [the native title legislation] … have reiterated … that [the native title legislation] does not require that "all" of the members of the relevant claim group be involved in the decision. The key question will be whether a reasonable opportunity to participate in the decision-making process has been afforded by the notice for a relevant meeting.*" [15]
>
> "*We consider the authorities in relation to processes under the NTA to be* ***illustrative*** *of how a seemingly rigid statutory obligation to consult persons holding a communal interest may operate in a workable manner*"[16] (emphasis added).

[14] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [95], [98], [103]-[104] and [109].

[15] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [98].

[16] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [96].

> "*there is no definition of what constitutes "consultation for the purpose of ref 11A... A titleholder will need to "demonstrate" to NOPSEMA that what it did constituted consultation appropriate and adapted to the nature of the interests of the relevant persons*"[17] (emphasis added).

It is clear from the Court's statement in relation to consultation with organisations that a Titleholder will have some decisional choice in identifying which natural person(s) are to be approached, how the information will be given to allow the "relevant person" to assess the possible consequence of the proposed activities on their functions, interests or activities, and how the requisite consultation is undertaken.[18] Woodside takes this to mean that consultation is not fixed to a rigid process, and indeed, will need to be adapted so that it is informed by the relevant person or group. Woodside has met its regulation 11A requirements through its consultation methodology (**Section 5.2**).

Consistent with the Tipakalippa Appeal, Woodside considers NTA-style "full group" meetings are not the only way for there to be compliance with regulation 11A in relation to Traditional Custodian relevant persons. Nominated representative corporations (such as Prescribed Bodies Corporates (PBCs) established under the NTA) have a designated role of representing the views of their member Traditional Custodians. They have established methods for engaging with their own members. Woodside will not undermine the purpose and authority of nominated representative corporations by requiring full group meetings where the nominated representative corporations have not requested engagement of members via full group meetings. We do not consider it appropriate for titleholders to direct or challenge the nominated representative corporations on how to engage with their members.

Woodside's approach described below demonstrates that sufficient information and a reasonable opportunity is provided to individual Traditional Custodians to provide feedback on Woodside activities beyond the opportunity provided to nominated representative corporations.

### 5.5.2 Consultation Method

Woodside's First Nations team has extensive expertise in engaging and working with First Nations organisations and individuals, including having worked within the Commonwealth native title and cultural heritage systems and state and territory cultural heritage and land rights systems, for several decades. The team understands the complexities of making information accessible to groups and individuals and engaging in accordance with First Nations groups' established channels of communication and methods of consultation. The First Nations team exercises its professional judgement and is deeply respectful of long-standing relationships (where in place) when considering consultation with First Nations groups. The First Nations team's approach is also informed by the established systems of recognition for First Nations groups and their nominated representative corporations within particular jurisdictions.

For example, the methodology for engaging with First Nations groups in the Northern Territory (not relevant for this EP) tends to centre around engagement through Aboriginal land councils (under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth)) as well as community meetings that target clan groups where they do not have PBCs or other nominated representative corporations to represent them. By contrast, recognition for First Nations groups and their nominated representative corporations in Western Australia falls under the *Native Title Act 1993* (Cth) because the vast majority of the Western Australian coastline is settled under the native title regime. This means that the methodology and process for consultation in Western Australia places greater emphasis on, but is not limited to Native Title Representative Bodies and PBCs. Native title determinations provide certainty about the appropriate Traditional Custodian groups that have the cultural authority to speak for country adjacent to the EMBA, and also help Woodside to identify Traditional Custodian persons and groups asserting Traditional Custodianship. The Full Court in the Tipakalippa Appeal explicitly endorsed methods of consultation with groups of relevant persons that are appropriate and adapted

[17] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [104].

[18] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [47] and [48].

to the characteristics of groups.[19] Woodside's consultation methodology is adapted and appropriate to the recognised systems of communal interests in Western Australia.

In Western Australia (relevant for this EP), Woodside has sought to follow the established, effective and respectful means of communication used by Native Title Representative Bodies and nominated representative corporations (including PBCs) with their respective First Nations communities. Woodside follows these processes for the appropriate broad capture of individuals' awareness of our activities, to self-identify (**Section 5.5.2.2),** and to provide feedback to inform the management of environmental impacts and risks.

Using these tools, Woodside communicates information about Environment Plans by:

- advertising in relevant newspapers. This encourages self-identification, by advertising proposed activities widely through newspapers that have national and intra-state circulation, i.e., Koori Mail, National Indigenous Times, The West Australian;
- creating carefully considered Consultation Summary Sheets with information developed by an Indigenous member of the First Nations Team to remove jargon and provide relevant information for people to have informed understandings about the activities;
- direct contact through nominated representative corporations;
- utilising social media (i.e. Facebook/Instagram), texts and emails. These mediums are the preferred communication methods used by Traditional Custodians throughout Western Australia and on that basis used by Native Title Representative Bodies and other government agencies and industry, to engage with Traditional Custodians or call meetings. First Nations woman, Professor Bronwyn Castle through 10 years of research found "Social media is an intrinsic part of daily life. The use of Facebook is around 20 per cent higher [among First Nations people] than the national average across all geographical locations" (Social media mob: being Indigenous online, Professor Bronwyn Carlson (2018));
- For ongoing consultation post regulation 11A consultation, Woodside introduced a Program of Ongoing Engagement with Traditional Custodians which sets out Woodside's commitment to ongoing engagement and support to care for and manage country, including Sea Country. The program was developed in response to Traditional Custodian feedback;
- Woodside has members of its First Nations team who are based in Karratha and Roebourne and who serve as on-Country points of contact for First Nations organisations and individuals. These team members have broad local knowledge and established, on-the-ground relationships within communities. This helps contribute to positive outcomes including encouraging First Nations attendance and involvement at Woodside's information sessions and Community roadshows. Team members on the ground engage in a great deal of preparatory work including by distributing information and providing notice to the community to support First Nations attendance at information sessions and Community roadshows;
- holding meetings on country at a place and time agreed with the Traditional Custodians and offering and providing financial assistance for meeting expenses (as appropriate); and
- providing information specifically designed to be easily understood, to reach all relevant people, and give a reasonable period of time for those people to make an informed assessment of the possible consequences of the proposed activity on them.

[19] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [95].[104].[153].

### 5.5.2.1 Identification of Relevant Persons

In order to undertake consultation, Woodside has developed a methodology for identifying relevant persons, in accordance with regulation 11A(1) of the Regulations (**Section 5.2 and 5.3**).

Specific to Woodside's approach for identifying relevant Traditional Custodians, Woodside's First Nations Communities Policy and consultation approach is guided by Traditional Custodians by directing consultations through their nominated representative corporation. This has been implemented by Woodside through consultation with a nominated representative corporation where that corporation has advised Woodside that it acts as the representative body for a Traditional Custodian group and has requested that Woodside engage with it as the representative body for that Traditional Custodian group.

Woodside asks nominated representative corporations (such as PBCs) and Native Title Representative Bodies to identify individuals that should be consulted, and enables individuals to self-identify in response to national and local advertising, social media and community engagement opportunities **(Section 5.5.2.4 and 5.9.1**). Where there is a nominated representative corporation for an area, unless directed by the nominated representative corporation, Woodside does not directly approach individuals for consultation, because this has the potential to undermine the role of the nominated representative corporations. Approaching individuals directly is a practice that is no longer considered acceptable because of divisions it has been shown to cause in communities. In addition to asking for the identification of individuals, Woodside also asks nominated representative corporations to distribute consultation information to whomever the nominated representative corporations deem appropriate including members of the nominated representative corporations who are communal rights holders.

Having said this, as set out in further detail in **Section 5.5.2.4** below, individuals are also given the opportunity to self-identify, consult and provide their own feedback on the proposed activity. When approached in this way, Woodside will engage individuals as relevant persons and will also (subject to any confidentiality or cultural restrictions) advise the nominated representative body of the consultation where it relates to cultural values. These methods of consultation are consistent with requirements for notification under the *Native Title Act 1993* (Cth), such as under the future act provisions (section 29), which requires notification of the Native Title Representative Body, the PBC (or nominated representative) and notification through newspapers. The notification process has been selected as a respectful, practical and pragmatic analogue for consultation with First Nations peoples, rather than requiring members to be notified via a formal authorisation process which aims to seek, from members, authorisation of agreements and native title/compensation claims under the Native Title Act 1993 (Cth)[20].

In this consultation, Woodside requested nominated representative corporations to identify any potential individual relevant persons for consultation, and to distribute consultation materials to their members. However, Woodside recognises that the process is voluntary and that it cannot compel nominated representative corporations (such as PBCs) to do so. Woodside also recognises that it would not be appropriate to seek to audit the nominated representative corporations for compliance with any member consultation request.

### 5.5.2.2 Opportunity to Self-identify and Identifying Other Individuals

Woodside requests nominated representative corporations and Native Title Representative Bodies to identify other individuals to consult with or individuals who may seek to self-identify for a proposed activity. Woodside also advertises broadly through Indigenous, national and local advertising, social media and community engagement opportunities (as described in **Section 5.9.1**) to provide individuals with an opportunity to consult. Woodside does not directly approach individuals for consultation, as this undermines the role of the nominated representative corporations (**Section**

[20] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193, at [104]

**5.5.2.1**). Woodside's approach to providing individual Traditional Custodians the opportunity to self-identify and consult for an Environment Plan is as follows:

- Woodside applies the principles of self-determination when consulting with Traditional Custodians by consulting through the Traditional Owners' authorised representative entities.
- Woodside requests that the information provided to representative entities is provided to their members but Woodside recognises the process is voluntary and Woodside cannot compel them to do so nor seek to audit the representative entities for compliance with any request.
- Representative entities cannot provide membership details to Woodside due to individual confidentiality requirements.
- Woodside requests advice as to who else Woodside should be consulting but recognises the process is voluntary and cannot compel nominated representative corporations to provide this information.
- Modern Indigenous engagement practises rely on the building and maintaining of respectful relationships. Most nominated representative corporations to date have requested the building of that relationship, where one is not already in place.
- While Woodside has, in some cases, approached individual directors and elders outside of this process due to requirements imposed in Environment Plan consultation, this approach is considered inappropriate by modern Indigenous engagement standards, fundamentally undermining the authority of the authorised representative entity and can be detrimental to the relationship.

For this proposed activity, Woodside requested nominated representative corporations (including PBCs) and Native Title Representative Bodies to identify any potential individual relevant persons for consultation, and to distribute consultation materials to their member base. However, Woodside recognises the process is voluntary and it cannot compel them to do so nor seek to audit the representative entities for compliance with any request. Woodside has not been directed to engage individual Traditional Custodians by nominated representative corporations for this proposed activity. Woodside has nevertheless provided reasonable opportunity for individual Traditional Custodians to engage in consultation through appropriate and adapted consultation methods.

#### 5.5.2.2.1 Sufficient Information

Woodside recognises that the information sufficient to allow a person or organisation to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities may vary and also may depend on the degree to which a relevant person is potentially affected.

Woodside produces a Consultation Information Sheet for each Environment Plan which is provided to relevant persons and organisations to provide the opportunity for feedback on the activity (**Section 5.4.1**). In response to Traditional Custodians' feedback, Woodside has tailored effective consultation methods for its activities, specifically designed for Traditional Custodians, so that information is provided in a form that is readily accessible and appropriate. The targeted Consultation Summary Sheet (as described in **Section 5.9.1**) developed and reviewed by Indigenous representatives so that content is appropriate to the intended recipients, is then provided to relevant Traditional Custodian groups. Phone calls are made to provide context to the consultation.

Where face to face consultation meetings are requested, Woodside coordinates engagement at the Traditional Custodians' location of choice (where practicable) and with their nominated attendees. Key project personnel, environmental and First Nations relations experts are typically present to enable effective communication and prompt response to questions. Materials for these sessions

incorporate visual aids such as photos, maps and videos, and plain language suitable for people with a non-technical background.

Woodside has sought to provide sufficient information to individual members of nominated representative corporations (such as PBCs) by providing information to representative bodies and requesting dissemination with members. However, Woodside recognises consultation is voluntary and it cannot compel them to do so nor would it be appropriate to seek to audit the representative entities for compliance with any request.

#### 5.5.2.3 Reasonable Period for Consultation

Woodside seeks to consult in order to support preparation of its Environment Plan. Woodside recognises that what constitutes a reasonable period for consultation should be considered on a case-by-case basis, with reference to the nature, scale and complexity of the activity (**Section 5.4.2**).

#### 5.5.2.4 Discharge of Regulation 11A

The Full Federal Court made clear in the Tipakalippa Appeal that consultation should be approached in a "*reasonable", "pragmatic" and "not so literal"* way, so that consultation obligations were capable of being met by titleholders (**Section 5.5.1**).[21] Consultation is a "real world activity" and must be capable of reasonable discharge.[22] The Full Federal Court referred to Native Title cases as an illustration that reasonable limits should be applied to consultation efforts to ensure the process is workable.[23]

When the titleholder demonstrates that it has provided sufficient information and a reasonable period for consultation, the regulation 11A consultation requirements are met.[24] Meeting these requirements is the evaluative judgment to determine reasonable satisfaction of the consultation obligation, and as such, the regulator uses its discretion to determine if these criteria are met. The nature of the person being consulted, and their function, interest and activity that may be affected, will inform the manner of consultation and the reasonable period to be afforded.[25]

The titleholder is not required to obtain consent from a consultee to engage in the activity or confirmation from a consultee that consultation is complete. A titleholder is required to provide an opportunity to consult.

The Federal Court has commented that a "reasonable opportunity" for consultation must be afforded to relevant persons.[26] A reasonable opportunity may not be every opportunity requested and is limited to reasonable opportunities to consult.

Woodside has completed all practicable and reasonable steps to discharge its consultation obligations. Woodside has provided sufficient information and a reasonable period of time to enable relevant persons to make an informed assessment of the possible impacts and risks of the activity on their functions, interests or activities, and sufficient time to provide relevant feedback for Woodside to assess relevant persons' claims and action the assessment and response. Woodside has also provided a reasonable opportunity for relevant persons to engage in genuine two-way dialogue on environmental impacts and concerns.

[21] *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 [89], [98], [103]-[104] and [109].
[22] *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [89].
[23] *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [96] and [103].
[24] Explanatory Statement, Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023, page 29.
[25] Explanatory Statement, Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023, page 30 and *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [153].

[26] *Cooper v National Offshore Petroleum Safety and Environmental Management Authority (No 2)* [2023] FCA 1158 at paragraph [11]; *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [153].

Woodside has discharged its duty under regulation 11A. Woodside considers that consultation under regulation 11A is complete.

**Appendix F, Table 1 and Table 2** of this Environment Plan sets out the history of consultation under regulation 11A. To the extent a relevant person says that it has further information to share or claims that consultation under regulation 11A has not completed, **Appendix F, Table 1 and Table 2** provide reasons specifically why Woodside considers consultation under regulation 11A has been met in relation to that relevant person.

## 5.6 Providing Feedback and Assessment of Merit of Objections or Claims

There are a number of ways in which feedback can be provided. Feedback can be provided through the Woodside feedback email or via the Woodside feedback toll free phone line as outlined in the Consultation Information Sheet and the Woodside website. Where appropriate, consultation may also be supported by phone calls or meetings. An Environment Plan feedback form is also available on Woodside's website enabling stakeholders to provide feedback on proposed activities, or to request additional information.

Woodside consults widely on its Environment Plans and notes that feedback is received in various forms. Feedback that is considered inappropriate or that puts the environment, health, safety or wellbeing of Woodside employees or operations at risk will not be tolerated. Woodside respects people's rights to protest peacefully and lawfully but actions that put the environment, health, safety or wellbeing of Woodside employees or operations at risk go beyond those boundaries.

Woodside accepts feedback and engages in consultation in order to achieve the aims set out in **Section 5.2**. Woodside recognises that there are persons and organisations that take a view that Woodside's operations and/or growth projects should be stopped or at least delayed as far as possible. Whilst Woodside assesses the merits of objections or claims received, it acknowledges NOPSEMA's guidance in its brochure entitled *Consultation on offshore petroleum environment plans information for the community*, which states that relevant persons are free to respond on any matter and raise any concern, however this may not be able to be considered if it is outside the scope or purpose of the Environment Plan and approval process, for example, statements of fundamental objection to offshore petroleum activities or information containing personal threats or profanities.

Feedback from relevant persons is reviewed and an assessment of the merits is made of information provided as well as objections or claims about the adverse impact of each activity to which the Environment Plan relates. This might, for instance, be done through a review of data and literature and for relevance to the nature and scale of the activity outlined in the Environment Plan. Consistent with the aim of consultation in **Section 5.2**, Woodside will consider information received when reviewing and designing measures to put in place to minimise harm to relevant persons and where reasonable or practical to further manage impacts and risks to ALARP and acceptable levels.

Woodside considers feedback during consultation from relevant persons and other persons Woodside chose to contact (see **Section 5.3.4**). This information is summarised in **Appendix F, Table 1** and **Table 2** of the Environment Plan and includes a statement of Woodside's response, or proposed response, if any, to each objection and claim.

In accordance with regulation 9(8) of the Environment Regulations, sensitive information (if any) in an Environment Plan, and the full text of any response by a relevant person to consultation under regulation 11A, must be contained in the sensitive information part of the plan and not anywhere else in the plan.

## 5.7 Ongoing Consultation

Consultation can continue to occur during the life of an Environment Plan, including after an Environment Plan has been accepted by NOPSEMA.

As per Woodside's ongoing consultation approach (refer to **Section 7.11**, feedback and comments received from relevant persons continue to be assessed and responded to, as required, throughout the life of an Environment Plan, including during its assessment and once accepted, in accordance with the intended outcome of consultation (as set out in **Section 5.2**).

Should consultation feedback be received following the acceptance of an Environment Plan that identifies a measure or control that requires implementation or updates to meet the intended outcome of consultation (see **Section 5.2**), Woodside will apply its Management of Change and Review process as appropriate (see **Section 7.7**).

## 5.8 Woodside's Methodology to Identify Relevant Persons

### 5.8.1 Identification of Relevant Persons Under Regulation11A(1)(a), (b) and (c)

Woodside's methodology for identifying relevant persons under regulations 11A(1)(a), (b) and (c) is as follows:

- Woodside considers the defined responsibilities of each of the departments and agencies to which the activities in the EMBA to be carried out under the Environment Plan may be relevant. This list of relevant department and agencies is formulated by reference to the responsibilities of the government departments as set out on their websites, in NOPSEMA's *GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area* guideline (January 2023), which describes where the Department is a relevant agency under the Environment Regulations, as well as experience and knowledge that Woodside has gained from years of operating in relation to the departments and agencies which Woodside has historically consulted over the years. This list is revised from time to time, for example, for the purposes of accommodating government restructures, renaming of departments, shifting portfolios and/or to account for new agencies that might arise.
- Woodside has categorised government department or agency groups as follows:

| | |
|---|---|
| **Government departments / agencies – marine** | Agencies with legislated responsibilities for use of the marine environment. |
| **Government departments / agencies – environment** | Agencies with legislated responsibilities for the protection of the marine environment. |
| **Government departments / agencies – industry** | The legislated Department of the responsible Commonwealth, State or Northern Territory Minister for Industry. |

- Woodside considers each of the responsibilities of the departments and agencies and determines whether those responsibilities overlap with potential risks and impacts specific to the proposed petroleum activity in the EMBA. The assessment is both activity and location based.
- Woodside acknowledges the roles and responsibilities of government departments and agencies acting on behalf of various industry participants. For example, AMSA – Marine Safety is responsible for the safety of vessels and the seafarers who are operating in the domestic commercial shipping industry and AHO is responsible for maritime safety and Notices to Mariners. To undertake the PAP in a manner that prevents a substantially adverse effect on the potential displacement of marine users, Woodside therefore consults AMSA – Marine Safety and AHO on its proposed activities. Woodside considers each of the responsibilities of the departments and agencies and determines those that would either be involved in the incident response itself or in

relation to the regulatory or decision-making capacity with respect to planning for the unlikely event of a worst-case hydrocarbon release incident response specific to the PAP. Feedback received, if any, is assessed in accordance with the intended outcome of consultation (as set out in **Section 5.2**).

- The list of those government departments and agencies assessed as relevant is set out in **Table 5-3**.
- Feedback received, if any, is assessed in accordance with the intended outcome of consultation (as set out in **Section 5.2**) and summarised at **Appendix F, Table 1** and **Table 2** as appropriate to the relevance assessment.

Woodside does not consult with departments or agencies with interests that do not overlap with risks and impacts specific to the proposed petroleum activity in the EMBA or would not be involved in incident response planning. For instance, in this Environment Plan, Woodside has not consulted with the department for the Minister of the Northern Territory because there is no overlap given that the proposed activities are in Commonwealth waters offshore of Western Australia.

### 5.8.2 Identification of Relevant Persons Under Regulation11A(1)(d))

Relevant persons under regulation11A (1)(d) are defined as a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the Environment Plan, or a revision of the Environment Plan. In identifying relevant persons, Woodside considers:

- the planned activities to be carried out under this Environment Plan (described in **Section 3**); and
- the EMBA by unplanned activities (identified in **Section 4** and assessed in **Section 6**).

To identify relevant persons who fall within regulation 11A(1)(d), Woodside adopts the following methodology, and then undertakes consultation with relevant persons which is set out further in **Section 5.8**.

- As a general proposition, Woodside assesses whether a person or organisation is a relevant person having regard to:
  - whether a person or organisation has functions interests or activities or that overlap with the PAA and EMBA; and
  - whether a person or organisation's functions, interests or activities may be affected by Woodside's proposed planned or unplanned activities.
- This assessment will include applying professional judgement, knowledge and current literature.
- Further, to assist in identifying the full range of relevant persons, Woodside considers the impacts and risks associated with its proposed activities and considers the broad categories of relevant persons who may be affected by the activities. For this Environment Plan, the broad categories are identified in **Table 5-1** below and identification methodology applied as set out in **Table 5-2**.
- The list of those persons or organisations assessed as relevant and persons or organisations Woodside chose to contact is set out in **Table 5-3**.
- Feedback received, if any, is assessed in accordance with the intended outcome of consultation (as set out in **Section 5.2**) and applying the categories of relevant persons methodology outlined in **Table 5-2**, as appropriate.

- Feedback from relevant persons is summarised at **Appendix F, Table 1**. Feedback from persons assessed as not relevant but whom Woodside chooses to contact or self-identified and Woodside assessed as not relevant are summarised at **Appendix F, Table 2**.

**Table 5-1: Categories of relevant persons**

| Category | Explanation |
|---|---|
| Commercial fisheries (Commonwealth and State) and peak representative bodies | Commonwealth or State Commercial Fishery with a fishery management plan recognised under the Commonwealth Fisheries Management Act 1991 (Cth) and Western Australian Fish Resources Management Act 1994 (WA), which may be amended from time to time.<br>Commonwealth peak fishery representative bodies are identified by AFMA. WAFIC is the peak representative body for state fishers in Western Australia. |
| Recreational marine users and peak representative bodies | Charter boat, tourism and dive operators identified by DPIRD specific to the location of the proposed activity.<br>Representative bodies are the recognised peak organisation(s) for recreational marine users. |
| Titleholders and operators | Registered holder of an offshore petroleum title or GHG title governed by the OPGGS Act and associated regulations. |
| Peak industry representative bodies | Recognised peak organisation(s) for the oil and gas sector. |
| Traditional Custodians (individuals and/or groups/entity) | Traditional Custodians are First Nations Australians who hold cultural rights and interests, or have cultural functions or perform cultural activities over particular lands and waters.<br>Where a First Nations person, group or entity self-identifies and/or asserts cultural rights, interests, functions or activities they will be included in the definition of Traditional Custodian for the purpose of this Environment Plan. |
| Nominated Representative Corporations | Nominated representative corporations are Traditional Custodians' nominated representative institutions such as Prescribed Body Corporates (PBC).<br>PBCs are established under the Native Title Act 1993 by Traditional Custodians to represent their entire Traditional Custodian group (defined broadly by reference to descents from an ancestor set who were known to be the Traditional Custodians at the time of European colonisation) and their interests including, among other things, management and protection of cultural values. |
| Native Title Representative Bodies | A Representative Aboriginal/Torres Strait Islander Bodies (RATSIB) is a regional organisation appointed under the Native Title Act 1993 (NTA) with prescribed functions, set out in Part 11 of the Native Title Act 1993, which relate to: facilitation and assistance; certification; dispute resolution; notifications; agreement making. They are also known, and referred to here, as Native Title Representative Bodies. |
| Historical heritage groups or organisations | Legislated or government enlisted groups or organisations responsible for the management of marine heritage. |
| Local government and recognised local community reference/liaison groups or organisations | Local government governed by the Local Government Act 1995 (WA) which is responsible for representing the local community. Recognised local community reference/liaison group or organisation in relation to oil and gas matters. |
| Other non-government groups or organisations | Non-government organisation with public website material targeting the proposed activity. |
| Research institutes and local conservation groups or organisations | Research institutes are government or private institutions that conduct marine or terrestrial research.<br>Local conservation groups are local non-government organisation that regularly conduct conservation activities focused on the local environment or wildlife. |

**Table 5-2: Methodology for identifying relevant persons within the EMBA undertaken under subcategory 11A(1)(d) – by category**

| Category | Relevant person identification methodology |
|---|---|
| Commercial fisheries (Commonwealth and State) and peak representative bodies | Woodside assesses relevance for commercial fisheries (Commonwealth and State) and their representative bodies using the following next steps in its methodology:<br>• Defining the parameters having regard to timing, location and duration of the proposed petroleum activity.<br>• Confirming whether the EMBA overlaps with the fisheries management area (i.e. the spatial area the fishery is legally permitted to fish in) (see **Section 4.9.3**).<br>• Woodside acknowledges WAFIC's consultation guidance[27] (accessed on 2 February 2023), that Titleholders develop separate consultation strategies for significant unplanned events (for example oil spill) where Titleholders can demonstrate the likelihood of such events occurring is extremely low. WAFIC's guidance is that consultation on unplanned events resulting in an emergency scenario should only be undertaken if an incident occurs (**see Appendix H)**.<br>• For Commonwealth and State commercial fisheries, Woodside assesses the potential spatial and temporal extent for interaction with the fishery by reviewing AFMA ABARES and DPIRD Fishcube data within the Operational Area and EMBA (see **Section 4.9.2**).<br>Assessment of relevance:<br>• State commercial fisheries that have been assessed as having a potential for interaction within the Operational Area or EMBA (see **Section 4.9.2**) are assessed as relevant to the proposed activity. Woodside acknowledges WAFIC's consultation guidance1 (see above) and applies this by:<br>- directly consulting fishery licence holders that are assessed as having a potential for interaction in the Operational Area; and<br>- consulting fisheries that are assessed as having a potential for interaction in the EMBA via WAFIC.<br>• Commonwealth commercial fisheries that have been assessed as having a potential for interaction within the Operational Area or EMBA (see **Section 4.9.2**) are assessed as relevant to the proposed activity.<br>• If Woodside has identified that a Commonwealth or State fishery is a relevant person, then Woodside also consults the fisheries relevant representative body. For example, WAFIC represents the interests of State fisheries in Western Australia. If a state fishery is identified as relevant, Woodside would also identify WAFIC as relevant. Recognised Commonwealth fishery representative bodies are identified by AFMA via its website. WAFIC is the only recognised state fishery representative body. |
| Recreational marine users and peak representative bodies | Woodside assesses relevance for recreational marine users and peak representative bodies using the following next steps in its methodology:<br>• From Woodside knowledge and operating experience, knowledge of recreational marine users in the area. This assessment is both activity and location based.<br>• Defining the parameters having regard to timing, location and duration of the proposed petroleum activity.<br>• Assessing the potential spatial and temporal extent for interaction with recreational marine users by reviewing DPIRD Fishcube data to assess whether there has been activity within the EMBA in the past 5 years.<br>Assessment of relevance:<br>• Recreational marine users that have been active in the past 5 years within the EMBA are assessed as relevant to the proposed activity. Woodside is provided |

[27] Consultation Approach for Unplanned Events - WAFIC

| Category | Relevant person identification methodology |
|---|---|
| | with the contact details of charter, boat tourism and dive operators specific to the region of the EMBA by DPIRD to consult with the relevant persons.<br>• If Woodside has identified recreational marine users as relevant persons, then Woodside also consults identified peak recreational marine user representative bodies. For example, Recfishwest represents the interests of recreational fishers. These representative bodies are identified via Woodside's existing consultation list, which is updated as appropriate via advice from known groups and DPIRD. |
| Titleholders and Operators | Woodside assesses relevance for other Titleholders and operators using the following next steps in its methodology:<br>Using WA Petroleum Titles (DMIRS-011) to determine overlap with other Titleholders or Operators permit areas within the EMBA.<br>From Woodside knowledge and operating experience, knowledge of other operators in the area.<br>Woodside produces a map showing the outcome of this assessment.<br>Assessment of relevance:<br>Titleholders and Operators whose permit areas are identified as having an overlap within the EMBA are assessed as relevant. |
| Peak industry representative bodies | Woodside assesses relevance for peak industry representative bodies using the following next steps in its methodology:<br>• Review of peak industry representative bodies responsibilities that Woodside actively participates in, with consideration of overlap between industry focus area and Woodside's proposed activities within the EMBA.<br>• Review of Woodside's existing consultation list.<br>• Website search to identify whether any additional peak industry representative bodies have been created whose responsibilities may overlap with Woodside's proposed activities within the EMBA.<br>Assessment of relevance:<br>• Peak industry representative bodies whose responsibilities are identified as having an overlap with Woodside's proposed activities within the EMBA are assessed as relevant. |
| Traditional Custodians (individuals and/or groups/entity) and Nominated Representative Corporations | Consistent with its understanding of the matters discussed in **Section 4.9.1** and **5.5**, to identify Traditional Custodian groups or individuals, Woodside:<br>• Uses existing systems of recognition to identify First Nations groups who overlap or are coastally adjacent to the EMBA (for example, recognition provided under native title or cultural heritage legislation, or marine park management plans, or identification by other First Nations groups or entities) (**Section 4.9.1**)<br>• Notifies and invites consultation with First Nations people through their nominated representative corporation (for example PBCs); or, in the case of native title, and where appropriate, the Native Title Representative Body (**Section 5.5.2.1**)<br>• Requests the nominated representative body to forward the notifications and invitations to consult to their members (members are individual communal rights holders) (**Section 5.5.2.1**)<br>• Requests advice as to other First Nations groups or individuals that should be consulted (**Section 5.5.2.1**)<br>• Requests the nominated representative body to provide consultation materials to its members (**Section 5.5.2.2.1)**<br>• Advertises widely so as to invite self-identification and consultation by First Nations groups and/or individuals (**Section 5.5.2.2.1**).<br>Further detail to Woodsides methodology is as follows.<br>Woodside uses the databases of the National Native Title Tribunal (**Section 4.9.1**):<br>• to understand whether there are any Native Title Claims (historical or current) or determinations overlapping or coastally adjacent to the EMBA; |

| Category | Relevant person identification methodology |
|---|---|
| | • to understand whether there are any relevant Indigenous Land Use Agreements (ILUA), registered with the National Native Title Tribunal that overlap or are adjacent to the EMBA that may identify Traditional Custodians or representative bodies to contact regarding potential cultural values.<br>Where there is a positive determination of native title, contacting the PBC or, where their representative is a Native Title Representative Body contacting the Native Title Representative Body.<br>Where appropriate, contacting the relevant Native Title Representative Body to request a list of any First Nations groups asserting Traditional Custodianship over an area of coastline adjacent to the EMBA.<br>Review of Commonwealth and State Marine Park Management Plans that overlap the EMBA which may identify Traditional Custodians or representative bodies to contact regarding potential cultural values.<br>In the WA context, any Aboriginal Corporation appointed as a Local Aboriginal Cultural Heritage Service (LACHS) under the Aboriginal Cultural Heritage Act 2021 for an area that overlaps the EMBA.<br>First Nations groups or individuals identified by a Traditional Custodian, nominated representative corporation, Native Title Representative Body.<br>Request to the PBC to distribute Woodside consultation materials through its membership. Woodside is unable to contact this membership through any other means.<br>Woodside has a number of public notification and information sharing processes by which individual Traditional Custodians can become aware of the proposed activity, its risks and impacts, and self identify.<br>Individuals that consider their functions, interests or activities may be affected by a proposed activity must self-identify for each Environment Plan. Woodside does not presume that self-identification for an activity, covered by another Environment Plan, automatically means that an individual/s functions, interest and activities may be affected by other activities where EMBAs overlap. This decision is for the individual to make. The public notification, information sharing, and consultation processes Woodside puts in place enables Traditional Custodians to become aware of proposed activities, assess any risks and impacts to their values, and enable individuals to self-identify.<br>Assessment of relevance:<br>Traditional Custodian groups, entities or individuals and Nominated Representative Corporations who are identified through the above methodology and overlap or are coastally adjacent to the EMBA are assessed as relevant. |
| Native Title Representative Bodies | Woodside assesses relevance for Native Title Representative Bodies using the following steps in its methodology (**Section 4.9.1**):<br>• A Representative Aboriginal/Torres Strait Islander Bodies (RATSIB) is a regional organisation appointed under the Native Title Act 1993 (NTA) with prescribed functions set out in Part 11 of the Native Title Act 1993, which relate to: facilitation and assistance; certification; dispute resolution; notifications; agreement making. They are also known, and referred to here, as Native Title Representative Bodies.<br>• Review of National Native Title Tribunal RATSIB areas that overlap or are coastally adjacent to the EMBA.<br>Assessment of relevance:<br>• Where the area for which a Native Title Representative Body is recognised under the Native Title Act 1993, overlaps with the EMBA or is coastally adjacent to the EMBA, Woodside will assess the Native Title Representative Body as relevant. |
| Historical heritage groups or organisations | Woodside assesses relevance for groups or organisations whose responsibilities are focused on historical heritage using the following next steps in its methodology:<br>• Using the Australasian Underwater Cultural Heritage Database to assess any known records Maritime Cultural Heritage sites (shipwrecks, aircraft and relics) within the EMBA (see **Section 4.9.1**). |

| Category | Relevant person identification methodology |
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| | Assessment of relevance:<br>• Where there is a known underwater heritage site (shipwrecks, aircraft and relics) within the EMBA, the relevant group or organisation that manages the site will be assessed as relevant. |
| Local government and recognised local community reference/liaison groups or organisations | Woodside assesses relevance for local government and recognised local community reference/liaison groups or organisations using the following next steps in its methodology:<br>• Review of Woodside maps (developed based on data from the WA Local Government, Sport and Cultural Industries My Council database and WA Local Government Association (WALGA) Local Government Directory maps) to assess any overlap between the local government's defined area of responsibility and the EMBA.<br>• Woodside hosts regular community reference/liaison group meetings. Members represent a cross-section of the community and local towns interests. Representatives are from community and industry and generally include, Woodside, State Government (for instance relevant Regional Development Commissions), Local Government, Indigenous Groups, Industry representative bodies, Community and industry organisations. Woodside considers these reference/liaison groups to be the appropriate recognised representatives of the local community for the oil and gas sector.<br>• Woodside reviews the community reference/liaison group's terms of reference to determine its area of responsibility and any overlap with the EMBA. For example, the Exmouth Community Liaison Group's area of responsibility in relation to Woodside's operational, development and planning activities, is defined in the terms of reference as the Exmouth sub-basin. Comparatively, the Karratha Community Liaison Group's area of responsibility is the Pilbara region (i.e. onshore).<br>Assessment of relevance:<br>• The local government whose defined area of responsibility overlaps the EMBA is assessed as relevant.<br>• The community reference/liaison group whose defined area of responsibility overlaps the EMBA is assessed as relevant and consulted collectively via the relevant reference/liaison group. |
| Other non-government groups or organisations | Woodside assesses relevance for other non-government groups or organisations using the following next steps in its methodology:<br>• Review of Woodside's existing consultation list.<br>• Website search of registered non-government groups or organisations (i.e. registered with an Australian Business Number (ABN) and publicly available contact information) that may have public website material specific to the proposed activity at the time of development of the Environment Plan.<br>• Organisation has a publicly available mission statement (or purpose) that clearly describes their collective functions, interests or activities.<br>• Review of current website material to identify targeted information which demonstrates functions, interests or activities relevant to the potential risks and impacts associated with planned activities.<br>Assessment of relevance:<br>• Registered non-government groups or organisations with current targeted public website material specific to the proposed activity at the time of developing the Environment Plan and who have demonstrated functions, interests or activities relevant to the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2**) will be assessed as relevant. |

| Category | Relevant person identification methodology |
|---|---|
| Research institutes and local conservation groups or organisations | Woodside assesses relevance for research institutes and local conservation groups or organisations using the following next steps in its methodology:<br>• Review of Woodside's existing consultation list.<br>• Website search for research institutes that may operate within the EMBA. This assessment is both activity and location based.<br>• Website search for local conservation groups or organisations that regularly conduct conservation activities within the EMBA.<br>Assessment of relevance:<br>• Where there is known research being undertaken by a research institute within the EMBA, the research institute that is conducting the research will be assessed as relevant.<br>• Local environmental conservation groups who regularly conduct conservation activities or have demonstrated conservation functions, interests or activities within the EMBA are assessed as relevant. This assessment is both activity and location based. |

### 5.8.3 Identification of Relevant Persons Under Regulation11A(1)(e)

Woodside adopts a case-by-case approach for each Environment Plan to assess relevance under regulation 11A(1)(e).

### 5.8.4 Assessment of Relevant Persons for the Proposed Activity

The result of Woodside's assessment of relevant persons in accordance with regulation 11A(1) is outlined at **Table 5-3** and **Appendix F, Table 1**.

Persons or organisations that Woodside assessed as not relevant but nonetheless chose to contact at its discretion in accordance with **Section 5.3.4** or self-identified and Woodside assessed as not relevant are summarised at **Table 5-3** and **Appendix F, Table 2**.

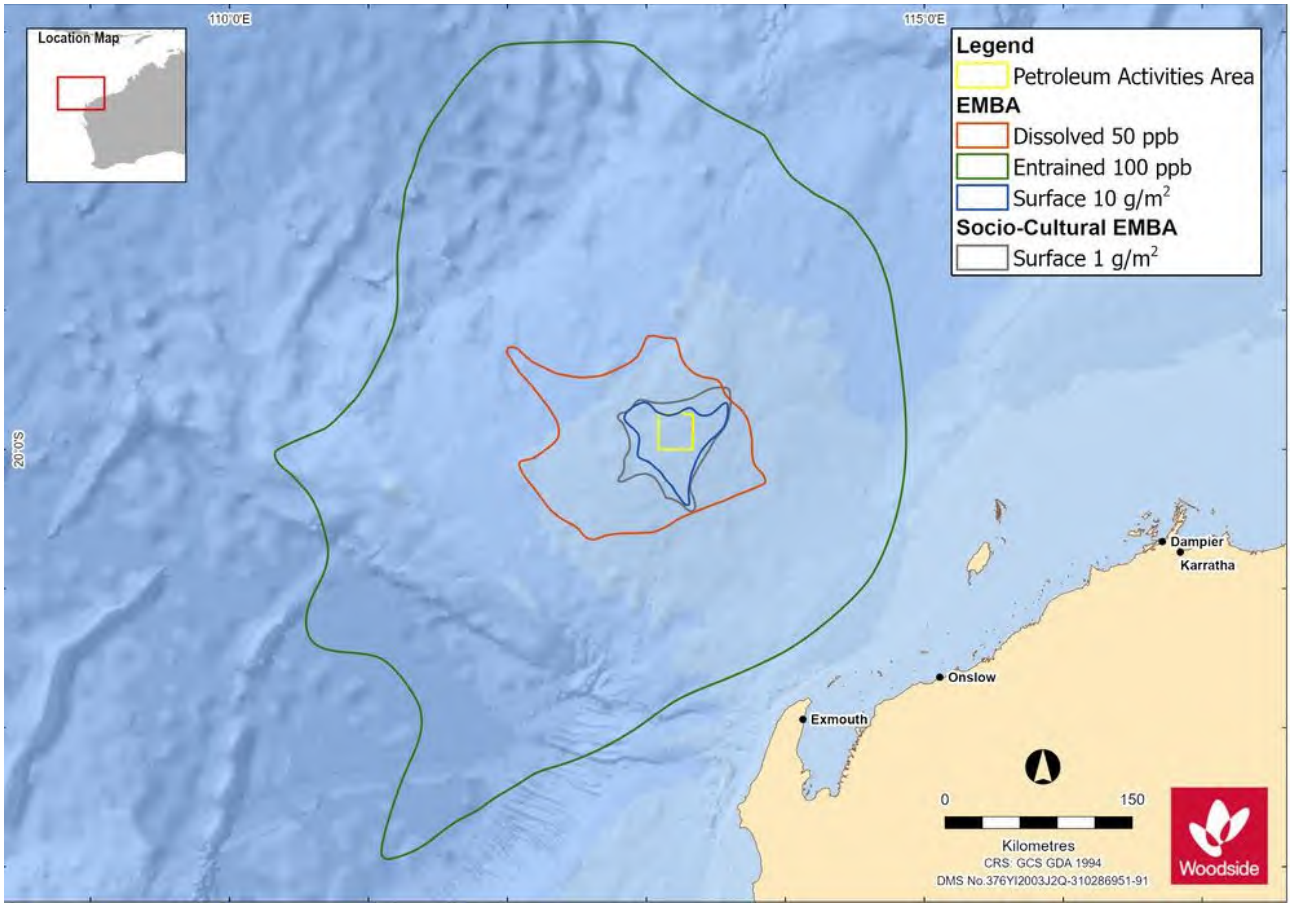


**Figure 5-3: Operational Area and EMBA for this Environment Plan.**

**Table 5-3: Assessment of relevance**

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| ***Commonwealth and WA State Government Departments or Agencies – Marine*** | | | |
| Australian Border Force (ABF) | Responsible for coordinating maritime security | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a).<br>ABF's responsibilities may be relevant to the activity as there are proposed vessel activities. | Yes |
| Australian Fisheries Management Authority (AFMA) | Responsible for managing Commonwealth fisheries | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a).<br>The North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA.<br>AFMA's responsibilities may be relevant to the activity as the North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. | Yes |
| Australian Hydrographic Office (AHO) | Responsible for maritime safety and Notices to Mariners | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a).<br>AHO's responsibilities may be relevant to the activity as there are proposed vessel activities. | Yes |
| Australian Maritime Safety Authority (AMSA) – Marine Safety | Statutory agency for vessel safety and navigation | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a).<br>AMSA – Marine Safety's responsibilities may be relevant to the activity as there are proposed vessel activities. | Yes |
| Australian Maritime Safety Authority (AMSA) – Marine Pollution | Legislated responsibility for oil pollution response in Commonwealth waters | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a).<br>AMSA – Marine Pollution's responsibilities may be relevant to the activity as the proposed activity has a hydrocarbon spill risk which may require AMSA response in Commonwealth waters. | Yes |
| Department of Agriculture, Fisheries and Forestry (DAFF) – Fisheries<br>*(formerly DAWE)* | Responsible for implementing Commonwealth policies and programs to support | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a).<br>The North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | agriculture, fishery, food and forestry industries | DAFF – Fisheries' (formerly DAWE) responsibilities may be relevant to the activity as the North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. | |
| Department of Defence (DoD) | Responsible for defending Australia and its national interests. | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a).<br>DoD's responsibilities may be relevant to the activity as defence training areas lie within the EMBA. | Yes |
| Department of Primary Industries and Regional Development (DPIRD) | Responsible for managing State fisheries | Woodside has applied its methodology for 'Government departments / agencies –marine' under regulation 11A(1)(b).<br>No State fisheries are active in the Operational Area. The Marine Aquarium Managed Fishery, Mackerel Managed Fishery (Area 2 and 3), West Coast Deep Sea Crustacean Managed Fishery and Pilbara Line Fishery are active in the EMBA.<br>DPIRD's responsibilities may be relevant to the activity as the government department responsible for State fisheries. | Yes |
| Department of Transport (DoT) | Legislated responsibility for oil pollution response in State waters | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(b).<br>The proposed activity has a hydrocarbon spill risk, which may require DoT response in State waters. | Yes |
| Department of Planning, Lands and Heritage (DPLH) | Responsible for state level land use planning and management, and oversight of Aboriginal cultural heritage and built heritage matters. | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(b).<br>There is no known Maritime Cultural Heritage overlapping the EMBA. | No |
| Pilbara Ports Authority | Responsible for the operation of the Port of Dampier. | Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(b).<br>The proposed activity does not have the potential to impact Pilbara Ports Authority's responsibilities as the EMBA does not overlap the Pilbara Ports Authority's area of responsibility. | No |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| ***Commonwealth and WA State Government Departments or Agencies – Environment*** | | | |
| Department of Agriculture, Fisheries and Forestry (DAFF) – Biosecurity (marine pests, vessels, aircraft and personnel)<br>*(formerly DAWE)* | DAFF administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity has the potential to transfer marine pests.<br>DAFF also has inspection and reporting requirements to ensure that all conveyances (vessels, installations and aircraft) arriving in Australian territory comply with international health regulations and that any biosecurity risk is managed.<br>DAFF requests to be consulted where an activity involves the movement of aircraft or vessels between Australia and offshore petroleum activities either inside or outside Australian territory. | Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a).<br>DAFF – Biosecurity's (formerly DAWE) responsibilities may be relevant to the proposed activities in the EMBA in the prevention of introduced marine species. | Yes |
| Department of Climate Change, Energy, the Environment and Water Agriculture (DCCEEW)<br>*(formerly DAWE)* | Responsible for implementing Commonwealth policies and programs to support climate change, sustainable energy use, water resources, the environment and our heritage. | Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a).<br>DCCEEW's (formerly DAWE) responsibilities may be relevant to the proposed activities in the EMBA as there are potential environmental impacts from the proposed activity.<br>There are known Maritime Cultural Heritage overlapping the EMBA. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | Administers the *Underwater Cultural Heritage Act 2018* in collaboration with the States, Northern Territory and Norfolk Island, which is responsible for the protection of shipwrecks, sunken aircraft and other types of underwater heritage and their associated artefacts in Commonwealth waters. | | |
| Director of National Parks (DNP) | Responsible for the management of Commonwealth parks and conservation zones. | Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a).<br>DNP's responsibilities may be relevant to the activity as DNP requires an awareness of activities that occur within AMPs, and an understanding of potential impacts and risks to the values of parks (NOPSEMA guidance note: N-04750-GN1785 A620236, June 2020). Titleholders are required to consult DNP on offshore petroleum and greenhouse gas exploration activities if they occur in, or may impact on the values of marine parks, including where potential spill response activities may occur in the event of a spill (i.e. scientific monitoring). | Yes |
| Ningaloo Coast World Heritage Advisory Committee (NCWHAC) | Supports the DBCA to manage the Ningaloo Coast World Heritage Area. | Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a).<br>The proposed activity does not have the potential to impact NCWHAC's responsibilities as the EMBA does not overlap the Ningaloo Marine Park. | No |
| Department of Biodiversity, Conservation and Attractions (DBCA) | Responsible for managing WA's parks, forests and reserves to achieve wildlife conservation and provide sustainable recreation and tourism opportunities. | Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(b).<br>The proposed activity EMBA does not overlap WA parks, forests or reserves.<br>Activities have the potential to impact marine tourism in the EMBA. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| ***Commonwealth and State Government Departments or Agencies – Industry*** | | | |
| Department of Industry, Science and Resources (DISR)<br>*(formerly DISER)* | Department of relevant Commonwealth Minister. | Required to be consulted under regulation 11A(1)(a). | Yes |
| Department of Mines, Industry Regulation and Safety (DMIRS) | Department of relevant State Minister | Required to be consulted under regulation 11A(1)(c). | Yes |
| ***Commonwealth Commercial fisheries and representative bodies*** | | | |
| North West Slope and Trawl Fishery | Commonwealth commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The fishery does not overlap the Operational Area. The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years. | Yes |
| Southern Bluefin Tuna Fishery | Commonwealth commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps the Operational Area and EMBA it has not been active in the Operational Area or EMBA within the last 5 years.<br>Woodside does not consider that the proposed activity will present a risk to licence holders, given since 1992, the majority of Australian catch has concentrated in south-eastern Australia. (Patterson et al., 2022). In addition, given fishing methods by licence holders for species fished in this fishery (Australia has a 35% share of total global allowable catch of Southern Bluefin Tuna, which is value-added through tuna ranching near Port Lincoln (South Australia), or fishing effort in New South Wales (Australian Southern Bluefin Tuna Industry Association). | No |
| Western Deepwater Trawl Fishery | Commonwealth commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last 5 years. The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Western Skipjack Fishery | Commonwealth commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps Operational Area and EMBA, it has not been active in the Operational Area or EMBA within the last 5 years.<br>Woodside does not consider that the activity will present a risk to licence holders, given the fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. The Fishery is not currently active and no fishing has occurred since 2009 (Patterson et al., 2022). In addition, interactions are not expected given the species' pelagic distribution fishing methods for species fished by licence holders. | No |
| Western Tuna and Billfish Fishery | Commonwealth commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps Operational Area and EMBA, it has not been active in the Operational Area or EMBA within the last 5 years.<br>Woodside does not consider that the activity will present a risk to licence holders, given fishing methods for species fished by licence holders. Future interactions are not expected given the species' pelagic distribution. | No |
| Commonwealth Fisheries Association (CFA) | Represents the interests of commercial fishers with licences in Commonwealth waters | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA.<br>CFA's functions may be relevant to the activity as the North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. | Yes |
| Australian Southern Bluefin Tuna Industry Association (ASBTIA) | Represents the interests of the Southern Bluefin Tuna Fishery and Western Skipjack Fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The Southern Bluefin Tuna Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Southern Bluefin Tuna Fishery, the ASBTIA has also been assessed as not relevant.<br>Woodside has provided information to the ASBTIA at its discretion in line with **Section 5.3.4** on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations. | No |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Tuna Australia | Represents the interests of the Western Tuna and Billfish Fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The Western Tuna and Billfish Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Western Tuna and Billfish Fishery, Tuna Australia has also been assessed as not relevant.<br>Woodside has provided information to Tuna Australia at its discretion in line with **Section 5.3.4** on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations. | No |
| Pearl Producers Association (PPA) | Peak representative organisation of The Australian South Sea Pearling Industry, with members in Western Australia and the Northern Territory | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The Pearl Oyster Managed Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Pearl Oyster Managed Fishery, the PPA has also been assessed as not relevant. | No |
| ***State Commercial fisheries and representative bodies*** | | | |
| Marine Aquarium Managed Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps the Operational Area it has not been active in the Operational Area within the last 5 years. The fishery overlap the EMBA and has been active in the EMBA within the last 5 years. | Yes |
| South West Coast Salmon Managed Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years.<br>Woodside does not consider that the activity will present a risk to licence holders, given fishers are active south of Perth and from the beach (previous WAFIC advice). | No |
| Mackerel Managed Fishery (Area 2 and 3) | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | Although Area 3 of the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last 5 years - no fishing occurs due to the water depths and distance from shore.<br>Area 2 and 3 of the fishery have been active in the EMBA within the last 5 years. | |
| Pilbara Crab Managed Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years.<br>The Operational Area overlaps with a closed area of the fishery (as per Schedule 2 of the draft Management Plan [DPIRD, 2018]) and therefore, fishing activity within the Operational Area is currently not permitted. | No |
| West Coast Deep Sea Crustacean Managed Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps the Operational Area, the fishery has not been active in the Operational Area within the last 5 years.<br>Fishing effort is primarily concentrated between Fremantle and Carnarvon. A single 10 nm CAES block (202125) was reportedly fished on the Exmouth Plateau at the southern boundary of the Operational Area sometime between 2003 and 2010 (How et al., 2015, 2017). However, fishing effort has not been reported here since and more recent catch and effort data (2010–2019) confirms no catch or effort within the Operational Area; the closest blocks fished during this period were located about 300 km south (10 nm CAES block 230130) of the Operational Area (DPIRD, 2021).<br>The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years. | Yes |
| Pearl Oyster Managed Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The fishery does not overlap the Operational Area. The fishery overlaps the EMBA but has not been active in the EMBA within the last 5 years.<br>Woodside does not consider that the activity will present a risk to licence holders given fishing methods and location for species fished by licence holders (fishing effort is mostly focussed in shallow coastal waters of 10-15 m depth, with a maximum depth of 35 m) (Lulofs rt al. 2002). | No |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| West Coast Rock Lobster Managed Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The fishery does not overlap the Operational Area. The fishery overlaps the EMBA but has not been active in the EMBA within the last 5 years. | No |
| Demersal Scalefish Fishery:<br>Pilbara Trawl Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The fishery does not overlap the Operational Area or EMBA. | No |
| Pilbara Trap Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>The fishery does not overlap the Operational Area or EMBA. | No |
| Pilbara Line Fishery | State commercial fishery | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last 5 years. The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years. | Yes |
| Western Australian Fishing Industry Council (WAFIC) | Represents the interests of commercial fishers with licences in State waters. | Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d).<br>No State fisheries are active in the Operational Area. The Marine Aquarium Managed Fishery, Mackerel Managed Fishery (Area 2 and 3), West Coast Deep Sea Crustacean Managed Fishery and Pilbara Line Fishery are active in the EMBA.<br>WAFIC's functions may be relevant to the activity as the peak representative body for State fisheries. | Yes |
| ***Recreational marine users and representative bodies*** | | | |
| Exmouth recreational marine users<br>Andro Maritime Services Australia<br>Aquatic Adventure Exmouth<br>Birds Eye View | Exmouth-based dive, tourism and charter operators | Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d).<br>Activities have the potential to impact Exmouth-based dive, tourism and charter operator's functions, interests or activities due to the location of activities and there has been recorded charter effort in the EMBA in the past 5 years. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Blue Horizon Charters<br>Blue Lightning Charters<br>Cape Immersion Tours<br>Coastal Adventure Tours<br>Coral Bay Ecotours<br>Cruise Ningaloo<br>Dampier Island Tourism<br>Dive Ningaloo<br>Evolution Fishing Charters<br>Exmouth Adventure Co.<br>Exmouth Dive Centre<br>Exmouth Fly Fishing<br>Exmouth Game Fishing Club<br>Indian Chief Charters<br>Innkeeper Sport Fishing Charter<br>Kings Ningaloo Reef Tours<br>Live Ningaloo<br>Mahi Mahi Fishing Charters<br>Montebello Island Safaris<br>Ningaloo Aviation<br>Ningaloo Blue<br>Ningaloo Coral Bay Boats<br>Ningaloo Discovery<br>Ningaloo Ecology Cruises<br>Ningaloo Fly Fishing<br>Ningaloo Marine Interaction<br>Ningaloo Reef Dive | | | |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Ningaloo Reef to Range Tours<br>Ningaloo Safari Tours<br>Ningaloo Sportfishing Charters<br>Ningaloo Whaleshark n Dive<br>Ningaloo Whaleshark Swim<br>Ocean Eco Adventures<br>On Strike Charters<br>Peak Sportfishing Charters<br>Pelican Charters<br>Sail Ningaloo<br>Sea Force Charters<br>Set the Hook<br>The Mobile Observatory<br>Three Islands<br>Top Gun Charters<br>Ultimate WaterSports<br>Venture Ningaloo<br>View Ningaloo<br>Warrior Princess Charters<br>Yardi Creek Boat Tours | | | |
| Gascoyne Recreational Marine Users<br>Silverado Charters Pty Ltd<br>Reel Force Charters Pty Ltd<br>D & N Nominees Pty Ltd<br>Lyons Family Super Pty Ltd | Gascoyne-based dive, tourism and charter operators | Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d).<br>Activities have the potential to impact Gascoyne-based dive, tourism and charter operator's functions, interests or activities due to the location of activities and there has been recorded charter effort in the EMBA in the past 5 years. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Seafresh Holdings Pty Ltd<br>Eco-Abrolhos Pty Ltd<br>C Emery Fishing Pty Ltd<br>On Strike Charters (WA) Pty Ltd<br>Melkit Pty Ltd<br>Maritime Engineering Services Pty Ltd<br>G. C. Bass Nominees Pty Ltd<br>Brefjen Nominees Pty Ltd<br>W.A Maritime Investments Pty Ltd<br>Blue Juice Tours Pty Ltd<br>Surefire Marine Services Pty Ltd<br>Makalee Pty Ltd<br>L & S Family Holdings Pty Ltd<br>Bondall Pty Ltd<br>Kw Marine Pty Ltd<br>Sharkbay Charters Pty Ltd<br>Bluecity Enterprises Pty Ltd<br>Jostan Holdings Pty Ltd<br>Monkey Mia Yacht Charters Pty Ltd<br>On Strike Charters (Wa) Pty Ltd<br>Rainfield Pty Ltd<br>Monster Sportfishing Adventures Pty Ltd | | | |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Lulamanzi Investments Pty Ltd<br>Millennial Charters Pty Ltd<br>Chapel Nominees Pty Ltd<br>Regalchoice Holdings Pty Ltd<br>Fawesome Expeditions Pty Ltd<br>On Strike Charters (WA) Pty Ltd<br>The Great Escape Charter Company Pty Ltd<br>Aoa International Pty Ltd<br>Fire Tiger Pty Ltd | | | |
| Recfishwest | Represents the interests of recreational fishers in WA. | Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d).<br>Activities have the potential to impact recreational fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years. | Yes |
| Marine Tourism WA | Represents the interests of marine tourism in WA. | Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d).<br>Activities have the potential to impact recreational fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years. | Yes |
| WA Game Fishing Association | Represents the interests of game fishers in WA. | Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d).<br>Activities have the potential to impact game fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| ***Titleholders and Operators*** | | | |
| Chevron Australia | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| Western Gas | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| Exxon Mobil Australia Resources Company | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| Shell Australia | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| INPEX Alpha Ltd | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| Osaka Gas Gorgon | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| Tokyo Gas Gorgon | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| JERA Gorgon | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| Finder Energy (Finder No 10) | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | Titleholder or Operator's permit areas overlaps the EMBA. | |
| KUFPEC | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| Santos WA Northwest / Santos Offshore / Santos WA PVG | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| OMV Australia | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| ***Peak Industry Representative bodies*** | | | |
| APPEA | Represents the interests of oil and gas explorers and producers in Australia. | Woodside has applied its methodology for 'Peak Industry Representative bodies' under regulation 11A(1)(d).<br>APPEA's responsibilities are identified as having an intersect with Woodside's planned activities in the EMBA. | Yes |
| ***Traditional Custodians and nominated representative corporations*** | | | |
| Murujuga Aboriginal Corporation (MAC) | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>MAC is the Nominated Representative Corporation under the Burrup and Maitland Industrial Estates Agreement (BMIEA), which underpins land access for the onshore component of the Scarborough Project. The EMBA does not overlap the Murujuga National Park.<br>MAC was established to represent the members of competing Native Title claims over Murujuga, collectively known as the Ngarda Ngarli and comprising Mardudhunera, Ngarluma, Yaburara, Yindjibarndi and Wong-Goo-Tt-Oo people. The determination of the competing Native Title claims resulted in no native title being found over the lands subject to the BMIEA or below the low water mark. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | MAC also owns and co-manages the Murujuga National Park, is responsible for the Dampier Archipelago National Heritage Place and is progressing the World Heritage nomination of the Murujuga Cultural Landscape.<br>Woodside has consulted with MAC in regard to the Scarborough Project area generally since 2018 and MAC has been involved in ethnographic surveys that included the planned activities of this EP.<br>As discussed further below, Woodside engaged YMAC as the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia to confirm the best approach to confirm additional cultural values (if any) for the broader Scarborough Project, the scope of which included the proposed activity for this EP. YMAC advised that the most appropriate stakeholders for the Scarborough project generally are MAC and NAC, who are not represented by YMAC (refer to **Appendix F, Table 1**). | |
| Ngarluma Aboriginal Corporation (NAC) | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>There are no native title claims or ILUAs that NAC is party to overlapping the EMBA or coastally adjacent to the EMBA.<br>As noted above (and discussed further below), Woodside sought guidance from YMAC as the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia to confirm the best approach to confirm additional cultural values (if any) for the broader Scarborough Project, the scope of which included the proposed activity for this EP. YMAC advised that the most appropriate stakeholders for the Scarborough project generally are MAC and NAC, who are not represented by YMAC (refer to **Appendix F, Table 1**).<br>Woodside chose to assess NAC as relevant under regulation 11A(1)(e). | Yes |
| Wirrawandi Aboriginal Corporation (WAC) | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>There are no native title claims or ILUAs that WAC is party to overlapping the EMBA or coastally adjacent to the EMBA. | Yes |
| Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC) | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>The Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which the | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | Baiyungu, Thalanyji and Yinggarda people are party to. The NTGAC and YAC are the Registered Native Title Body Corporates holding native title on behalf of the Baiyungu, Thalanyji and Yinggarda people.<br>The NTGAC is also party, with the WA State Government, to the Ningaloo Conservation Estate Indigenous Land Use Agreement (the ILUA), which is coastally adjacent to the EMBA. The NTGAC is responsible for the joint management of the inner Ningaloo Marine Park (State Waters), the Cape Range National Park and new conservation areas extending along the Ningaloo Coast, which runs in parallel to the outer Ningaloo Marine Park in Commonwealth waters.<br>The NTGAC's nominated representative is the YMAC and the NTGAC executive officer and contact officer pursuant to the Corporations (Aboriginal and Torres Strait Islander) Act 2006 is employed by YMAC. Woodside has therefore consulted the NTGAC, via YMAC. | |
| Yinggarda Aboriginal Corporation (YAC) | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>The Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which the Baiyungu, Thalanyji and Yinggarda people are party to. The NTGAC and YAC are the Registered Native Title Body Corporates holding native title on behalf of the Baiyungu, Thalanyji and Yinggarda people.<br>The YAC nominated representative was the YMAC and the YAC executive officer and contact officer pursuant to the Corporations (Aboriginal and Torres Strait Islander) Act 2006 is employed by YMAC. Woodside therefore consulted YAC, via YMAC. Woodside was advised that as of late April 2023, the nominated representative for YAC was now Gumala Aboriginal Corporation. | Yes |
| Robe River Kuruma Aboriginal Corporation (RRKAC) | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>There are no native title claims or ILUAs that the RRKAC is party to overlapping the EMBA or coastally adjacent to the EMBA. | Yes |
| Yindjibarndi Aboriginal Corporation | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>There are no native title claims or ILUAs that the Yindjibarndi Aboriginal Corporation is party to overlapping the EMBA or coastally adjacent to the EMBA. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | Woodside chose to assess the Yindjibarndi Aboriginal Corporation as relevant under regulation 11A(1)(e). | |
| Buurabalayji Thalanyji Aboriginal Corporation (BTAC) | Representative Aboriginal Corporation | Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d).<br>The Thalanyji native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which BTAC is the Registered Native Title Body Corporate for.<br>BTAC is also party to the Macedon ILUA which is coastally adjacent to the EMBA. | Yes |
| ***Native Title Representative Bodies*** | | | |
| Yamatji Marlpa Aboriginal Corporation (YMAC) | Native Title Representative Body | Woodside has applied its methodology for 'Native Title Representative Bodies' under regulation 11A(1)(d).<br>YMAC is the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia. As such, they are not a Prescribed or Registered Native Title Body Corporate but exist to assist native title claimants and holders.<br>The NTGAC's nominated representative is YMAC. Woodside has therefore consulted the NTGAC via YMAC.<br>YMAC was also the nominated representative for YAC. Woodside was advised that as of late April 2023, the nominated representative for YAC is now Gumala Aboriginal Corporation.<br>Woodside contacted YMAC to seek guidance with respect to the appropriate Traditional Custodian group(s) to engage with respect to the proposed activity where this was not clear.<br>YMAC's functions may be relevant to the proposed activity in relation to its facilitation and coordination function as a Native Title Representative Body under applicable federal legislation. | Yes |
| ***Self-identified First Nations Groups*** | | | |
| Ngarluma Yindjibarndi Foundation Ltd (NYFL) | Traditional Custodian - entity | Woodside has applied its methodology for 'Traditional Custodians' under regulation11 A 1 (d).<br>Prior to the resolution of the Ngarluma and Yindjibarndi native title claim, the Ngarluma and Yindjibarndi registered native title claimants, the NWS JVs and Woodside entered into the Northwest Shelf Agreement 1998. In 1999 the Ngarluma and Yindjibarndi native title claim | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | was settled with the Federal Court appointing, at the request of the common law native title holders, the Ngarluma Aboriginal Corporation (NAC) as PBC to represent the communal interests of the Ngarluma people and the Yindjibarndi Aboriginal Corporation (YAC) as PBC to represent the communal interests of the Yindjibarndi people.<br>Both NAC and YAC are relevant people.<br>NYFL was subsequently created to act as Trustee for the Trust under the Agreement and to carry on the business of enterprise development, investment and social welfare.<br>NYFL self-identified and has advised it is relevant for this EP. | |
| ***Historical cultural heritage groups or organisations*** | | | |
| Western Australian Museum | Manages 200 shipwreck sites of the 1,500 known to be located off the Western Australian coast. | Woodside has applied its methodology for 'Historical cultural heritage groups or organisations' under regulation 11A(1)(d).<br>There are no known shipwrecks overlapping the EMBA which the Western Australian Museum may be responsible for. | No |
| ***Local government and community representative groups or organisations*** | | | |
| Shire of Exmouth | Local government governed by the Local Government Act 1995 representing the suburbs and localities of Exmouth, Learmonth and North West Cape. | Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d).<br>The Shire of Exmouth's area of responsibility does not overlap the EMBA. The Shire of Exmouth was consulted as a member of the Exmouth Community Reference Group.<br>Under subregulation 11 A 1 (e), Woodside, at its discretion, chose to assess the Shire of Exmouth as a relevant person. | Yes |
| City of Karratha | Local government governed by the Local Government Act 1995 representing the suburbs and localities of Baynton, Baynton West, Bulgarra, Cossack, Dampier, Gap Ridge, Karratha, Karratha Industrial Estate, Jingarri, Madigan, Millars Well, Nickol, Pegs Creek, | Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d).<br>The City of Karratha's area of responsibility does not overlap the EMBA. The City of Karratha was consulted as a member of the Karratha Community Liaison Group.<br>Under subregulation 11 A 1 (e), Woodside, at its discretion, chose to assess the City of Karratha as a relevant person. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | Point Samson, Roebourne, Whim Creek and Wickham. | | |
| Exmouth Community Reference Group (CRG)<br>Base Marine<br>Bgahwan Marine<br>Cape Conservation Group Inc.<br>DBCA<br>Department of Defence<br>Department of Transport<br>Exmouth Bus Charter<br>Exmouth Chamber of Commerce and Industry<br>Exmouth District High School<br>Exmouth Freight and Logistics<br>Exmouth Game Fishing Club<br>Exmouth Tackle and Camping Supplies<br>Exmouth Visitors Centre<br>Exmouth Volunteer Marine Rescue<br>Fat Marine<br>Gascoyne Development Commission<br>Gun Marine Services<br>Ningaloo Lodge<br>Offshore Unlimited<br>Shire of Exmouth | The Exmouth CRG represents the interests of a range of local government, industry and community organisations in relation to oil and gas matters in the Exmouth region. | Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d).<br>The Exmouth CRG's area of responsibility under its terms of reference overlaps the EMBA. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| BHP Petroleum<br>Santos<br>Community Member | | | |
| Karratha Community Liaison Group (KLG)<br>WA Police<br>Karratha Health Care<br>Development WA<br>Ngarluma Yindjibarndi Foundation Ltd (NYFL)<br>Department of Education<br>Pilbara Ports Authority<br>Regional Development Australia<br>Pilbara Development Commission<br>Dampier Community Association<br>City of Karratha<br>Karratha & Districts Chamber of Commerce and Industry<br>Horizon Power<br>Murujuga Aboriginal Corporation (MAC)*<br>Department of Local Government, Sport and Cultural Industries<br>**MAC was consulted directly as described above.* | The KLG is the recognised community group that represents the interests of a range of local government, industry and community organisations in relation to oil and gas matters in the Pilbara region. | Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d).<br>The KLG's area of responsibility under its terms of reference does not overlap the EMBA.<br>Under subregulation 11 A 1 (e), Woodside, at its discretion, chose to assess the KLG as a relevant person. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| ***Other non-government groups or organisations*** | | | |
| 350 Australia (350A) | Non-government organisation | During the course of preparing the EP, 350A self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d).<br>Woodside has assessed that 350A's public website material demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2**) | Yes |
| Australasian Centre for Corporate Responsibility (ACCR) | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine ACCR's relevance for the proposed activity.<br>Woodside has assessed that ACCR's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2**).<br>Woodside chose to contact ACCR at its discretion in line with **Section 5.2**. | No |
| Australian Conservation Foundation (ACF) | Non-government organisation | During the course of preparing the EP, ACF self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d).<br>Woodside has assessed that ACF's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2**). | Yes |
| Australian Marine Conservation Society (AMCS) | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine AMCS's relevance for the proposed activity.<br>Woodside has assessed that AMCS's public website material demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2**). | Yes |
| Climate Council | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine Climate Council's relevance for the proposed activity.<br>Woodside has assessed that Climate Council's public website material does not demonstrate an interest with the potential risks and impacts associated with planned | No |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).**<br>Woodside chose to contact Climate Council at its discretion in line with **Section 5.2**. | |
| Conservation Council of Western Australia (CCWA) | Non-government organisation | During the course of preparing the EP, CCWA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d).<br>Woodside has assessed that CCWA's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).** | Yes |
| Doctors for the Environment (DEA) | Non-government organisation | During the course of preparing the EP, DEA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d).<br>Woodside has assessed that DEA's public website material and feedback does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).** | No |
| Extinction Rebellion WA (XRWA) | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine XRWA's relevance for the proposed activity.<br>Woodside has assessed that XRWA's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).**<br>Woodside chose to contact XRWA at its discretion in line with **Section 5.2**. | No |
| Friends of Australian Rock Art. Inc (FARA) | Non-government organisation | During the course of preparing the EP, FARA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d).<br>Woodside has assessed that FARA's public website material and feedback does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).** | No |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Greenpeace Australia Pacific (GAP) | Non-government organisation | During the course of preparing the EP, GAP self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d).<br>Woodside has assessed that GAP's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).** | Yes |
| International Fund for Animal Welfare (IFAW) | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine IFAW's relevance for the proposed activity.<br>Woodside has assessed that IFWA's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).**<br>Woodside chose to contact IFAW at its discretion in line with **Section 5.2**. | No |
| Lock The Gate Alliance (LTGA) | Non-government organisation | During the course of preparing the EP, LTGA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d).<br>Woodside has assessed that LTGA's public website material and feedback does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).** | No |
| Market Forces | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine Market Forces relevance for the proposed activity.<br>Woodside has assessed that Market Forces public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).**<br>Woodside chose to contact Market Forces at its discretion in line with **Section 5.2**. | No |
| Say No to Scarborough Gas (SNTSG) | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine SNTSG's relevance for the proposed activity. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| | | Woodside has assessed that SNTSG's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).** | |
| Sea Shepherd Australia (SSA) | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine SSA's relevance for the proposed activity.<br>Woodside has assessed that SSA's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).**<br>Under subregulation 11 A 1 (e), Woodside, at its discretion, chose to assess SSA as a relevant person. | Yes |
| The Wilderness Society (TWS) | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine TWS's relevance for the proposed activity.<br>Woodside has assessed TWS's public website material and feedback, with the latter demonstrating an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2).** | Yes |
| World Wildlife Fund (WWF) Australia | Non-government organisation | Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine WWF's relevance for the proposed activity.<br>Woodside has assessed that WWF's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2**)**.**<br>Woodside chose to contact WWF at its discretion in line with **Section 5.2**. | No |
| ***Research institutes and local conservation groups or organisations*** | | | |
| University of Western Australia (UWA) | Research institute | Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine UWA's relevance for the proposed activity.<br>There is no known research being undertaken by the UWA that intersects within the EMBA.<br>Woodside chose to contact UWA at its discretion in line with **Section 5.2**. | No |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Western Australian Marine Science Institution (WAMSI) | Research institute | Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine WAMSI's relevance for the proposed activity.<br>There is no known research being undertaken by WAMSI that intersects within the EMBA<br>Woodside chose to contact WAMSI at its discretion in line with **Section 5.2**. | No |
| Commonwealth Scientific and Industrial Research Organisation (CSIRO) | Research institute | Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine CSIRO's relevance for the proposed activity.<br>There is no known research being undertaken by CSIRO that intersects within the EMBA.<br>Woodside chose to contact CSIRO at its discretion in line with **Section 5.2**. | No |
| Australian Institute of Marine Science (AIMS) | Research institute | Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine AIMS's relevance for the proposed activity.<br>There is no known research being undertaken by AIMS that intersects within the EMBA.<br>Woodside chose to contact AIMS at its discretion in line with **Section 5.2**. | No |
| National Energy Resource Australia (NERA) Collaborative Seismic Environment Plan Project (CSEP) acting for a consortium of operators | Titleholder or Operator | Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d).<br>During the course of preparing the EP, NERA CSEP self-identified for a related EP and requested to be consulted. Titleholder or Operator's permit areas overlaps the EMBA. | Yes |
| ***Other*** | | | |
| Save Our Songlines (SOS) | Representatives of Non-Government Organisation Save Our Songlines and/ or individuals [redacted] and/ or [redacted] | Woodside has applied its methodology for 'Traditional Custodians and nominated representative corporations' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine Save Our Songlines (SOS) and/ or [redacted] and/ or [redacted] relevance for the proposed activity.<br>During the course of preparing the EP, Save Our Songlines and/ or [redacted] and/ or [redacted] self-identified and requested to be consulted on Scarborough EPs.<br>Woodside has assessed that SOS and/ or [redacted] and/ or [redacted] feedback demonstrates an interest with the proposed activity. | Yes |

| Person or Organisation | Summary of responsibilities and/or functions, interests or activities | Assessment of relevance | Relevant person |
|---|---|---|---|
| Woodside Come Clean | Campaign website | Woodside Come Clean is not a registered organisation (i.e. no Australian Business Number (ABN)) and has no contact details publicly available. As this is not a group or organisation, but rather a campaign website, it would not be reasonable for Woodside to consider relevance for the proposed activity, nor attempt to consult.<br>Irrespective, Woodside has reviewed the Woodside Come Clean public website material and determined that the material does not demonstrate any intersect with potential direct impacts specific to the proposed petroleum activity, while remaining in accordance with the intended outcome of consultation (as set out in **Section 5.2**).<br>Woodside notes that the Woodside Come Clean campaign website links to Say No to Scarborough Gas, which Woodside has consulted for the proposed activity. | No |

## 5.9 Consultation Activities and Additional Engagement for the Scarborough Drilling and Completions Environment Plan

Woodside has been conducting extensive consultation with relevant persons and other parties since February 2018, when preliminary consultation for the Scarborough OPP commenced with interested and affected stakeholders as part of a planned, integrated and consistent approach to stakeholder engagement for Woodside's proposed opportunities (including the Browse to North West Shelf (NWS) Project, Scarborough, Pluto Train 2, NWS Project Extension and Pluto-NWS Interconnector). Consultation aims to be inclusive, transparent, voluntary, respectful and two-way. Consultation was undertaken by email, letter, phone call or meeting.

- Woodside advertised the planned activities proposed for this Environment Plan in the national, state and relevant local newspapers including The Australian, The West Australian, Pilbara News (October 2022 and January 2023), Midwest Times, North West Telegraph and Geraldton Guardian (January 2023) (see **Appendix F, reference 1.89**). Regional newspapers do not require subscription and are available and in some cases delivered directly to households. All communities within or adjacent to the EMBA had access to this information via this media. No direct comments or feedback were received from the advertisements.
- A Consultation Information Sheet was provided to relevant persons and persons Woodside chose to contact (see **Section 5.3.4**), which included details such as an activity overview, maps, a summary of key risks and/or impacts and management measures (**Appendix F, reference 1.1**).
- An activity update Consultation Information Sheet was provided to relevant persons and persons Woodside chose to contact (see **Section 5.3.4**), which included an update regarding planned activities, information regarding the EMBAs for this Environment Plan and additional information relating to mitigation and managements measures for this Environment Plan (**Appendix F, reference 1.25**).
- Since the commencement of the initial consultation period in July 2021, the Stakeholder Consultation Information Sheet has been available on the Woodside website. The activity update Consultation Information Sheet has been available since January 2023. The Woodside Consultation Information Sheets include a toll-free 1800 phone number and Woodside's feedback email address (feedback@woodside.com.au).
- Additional targeted information was provided to relevant marine users including AHO and AMSA – Marine Safety (**Appendix F, reference 1.3, 1.4 and 1.5**). The targeted information included maps and additional information relevant to the specific category of persons. The relevant persons had a 30-day period in which to provide feedback.
- Where appropriate, Woodside conducted phone calls and meetings with relevant persons.
- Where appropriate, targeted follow-up emails were sent to relevant persons who had not provided a response prior to the close of the target feedback period.
- While ensuring that the particulars of each activity (including description, planned and unplanned impacts and controls) are adequately covered, Woodside conducts consultation with relevant persons on all Scarborough Project activities for which they are relevant in a combined manner. This achieves efficiency for Woodside and the relevant person, and ensures that all activities are understood in their broader context.
- Woodside considered relevant person responses and assessed the merits and relevance of objections and claims about the potential adverse impact of the proposed activity set out in the Environment Plan, in accordance with the intended outcome of consultation (see **Section 5.2**).

- Consultation activities undertaken with relevant persons are summarised at **Appendix F, Table 1**.
- Engagement undertaken with persons or organisations Woodside assessed as not relevant but chose to contact (see **Section 5.3.4**) or self-identified and Woodside assessed as not relevant are summarised at **Appendix F, Table 2**.
- From 3 May 2023, Woodside commenced a geotargeted sponsored social media campaign (**Appendix F, reference 1.91**) to various local government authorities that are within or coastally adjacent to the EMBA for the proposed activities. The campaign provided the opportunity for individuals (including self-identified traditional custodians) who may be interested in Woodside's activities to participate in consultation. The campaign also advised persons or organisations on how they can find out about Woodside's proposed activities by visiting Woodside's website.

**Community information sessions**

- Community Information Sessions were held in Roebourne on 5, 10, 19 and 24 May, 22 June, and 19 July 2023; in Exmouth on 17 June 2023; and Broome, Derby and Kununurra on 12, 13 and 15 June 2023 respectively. Ahead of the events, Woodside advertised the sessions via the means below which provided the opportunity for local individuals to become aware of the event and have access to experts and information about the activity. The methods used to promote these consultation opportunities were developed with input from Indigenous representatives and were adapted to incorporate culturally appropriate and accessible language to encourage engagement and understanding of Woodside's proposed activities:
  - Advertising in the Broome Advertiser and Kimberley Echo on 1 and 8 June 2023 **(Appendix F, reference 1.92.1)** and for the Karratha Community Session in the Pilbara News on 28 June 2023 (**Appendix F, reference 1.93.3**).
  - From 8 June 2023, Woodside commenced a geotargeted social media campaign along the coastline from Geraldton to Derby (**Appendix F, reference 1.91**) advertising the community information sessions. A Facebook information campaign was targeted in Exmouth to ensure it reached communities where the Exmouth Consultation Information Session was planned to be held. **(Appendix F, reference 1.94.1)** A Karratha Community Information Session was advertised via a Facebook post on 28 June 2023 and a geotargeted social media campaign from 16 June to 29 June 2023 **(Appendix F, reference 1.93.3)**.
  - Directly contacting local Traditional Custodian groups to invite representatives to attend the Community Information Sessions and providing the event information (see **Appendix F, Table 1**).
  - Advertising in Roebourne with posters on four community boards and dropped posters to community locations; and put information and posters on the Roebourne Community Calendar (**Appendix F, reference 1.93.1 and 1.93.2**).
  - Representatives from Woodside, including project and environment personnel equipped to answer technical questions, attended the event. Copies of the Consultation Information Sheets and bespoke targeted Summary Consultation Information Sheets were available to attendees. Community members were able to engage with Woodside representatives to understand the proposed activity and how it may affect them, ask questions and provide their feedback.
- Community Information Sessions were held in Karratha on 28 and 29 June 2023. Woodside advertised the sessions (see below) providing the opportunity for individuals to become aware of the event and have access to information as well as people who can answer questions and provide information about the activity. The methods used to promote these consultation opportunities were developed with input from Indigenous representatives and were adapted to

incorporate culturally appropriate and accessible language to encourage engagement and understanding of Woodside's proposed activities:

- Ahead of the 28 June 2023 event, a story was posted on Woodside's Facebook page **(Appendix F, reference 1.93.3)** sharing details of its shopping centre stand where Consultation Information Sheets regarding planned and proposed activities were available, including the activities proposed under this Environment Plan.
- Ahead of the 29 June 2023 event, the Community Information Session was advertised in the Pilbara News ), via a geotargeted social media campaign in Karratha and surrounding areas and by posting the event details on Woodside's Facebook page (**Appendix F, reference 1.93.3).**
- Representatives from Woodside, including project and environment personnel equipped to answer technical questions, attended the event. Copies of the Consultation Information Sheets and bespoke targeted Summary Consultation Information Sheets were available to attendees. Community members were able to engage with Woodside representatives to understand the proposed activity and how it may affect them, ask questions and provide their feedback.

- Woodside had a stand at the annual FeNaCING Festival in Karratha on 5 and 6 August 2023. Members of Woodside's Corporate Affairs and Operations teams actively engaged with the community to discuss proposed Environment Plan activities. Consultation Information Sheets for a number of Woodside Environment Plans including this Environment Plan were available. Approximately 2,000 people visited the Woodside stand (based on the number of completed consultation forms and questionnaires). This consultation opportunity was promoted in the Pilbara News on 2 August 2023, and a story appeared on the Woodside North West Facebook page on 2 August 2023. (**Appendix F, reference 1.93.4**).
- Woodside had a stand at the Passion of the Pilbara festival in Onslow on 18 August 2023. Members of Woodside's Corporate Affairs team actively engaged with the community to discuss proposed Environment Plan activities. Consultation Information Sheets for a number of Environment Plans including this Environment Plan were available. Approximately 100 people visited the Woodside stand.
  - This consultation opportunity was promoted in a story on the Woodside North West Facebook page on 17 August 2023. **(Appendix F, reference 1.93.5).**
- Woodside consulted the Karratha, Port Hedland and Roebourne communities on Environment Plan activities during 18–20 September 2023. Members of Woodside's Corporate Affairs, First Nations, Environment and Scarborough Project teams actively engaged the community to discuss proposed Environment Plans, including the Scarborough and Browse projects.
  - 18 Sept 2023: Karratha Shopping Centre 8am–12pm; Red Earth Arts Precinct 3–6pm. Estimated number of people consulted: 20;
  - 19 Sept 2023: Port Hedland, South Hedland Square 10am–5pm. Estimated number of people consulted: 20;
  - 20 Sept 2023: Roebourne, Woodside Office 10am–4pm. Estimated number of people consulted: no attendance at the session due to Sorry Business and multiple Aboriginal corporation meetings which were unknown at the time of scheduling/planning engagements;
  - These consultation opportunities were promoted in the Pilbara News on 13 September 2023, and via Facebook and Instagram social media campaigns from 6 to 16 September 2023. **(Appendix F, reference 1.93.6).**

### 5.9.1 Traditional Custodian Specific Consultation

In addition to the approaches above including community information sessions, additional activities were undertaken with relevant Traditional Custodians, which were specifically designed to provide for effective engagement with Traditional Custodians and so that information was provided in a form that was readily accessible and appropriate (**Section 5.5**). Consultation undertaken specifically with Traditional Custodians for this Environment Plan includes:

- Direct engagement with nominated representative corporations via the contact listed on the ORIC website, requesting advice on how they would like to be engaged and asking whether other members and/or individuals should be consulted. This has resulted in:
  - Meetings with directors, elders and any nominated representatives, on country or in Perth;
  - Requests and offers of resourcing to enable and support consultation;
  - Exchange of written feedback and correspondence;
  - A Summary Consultation Information Sheet, developed and reviewed by Indigenous representatives in collaboration with technical experts to ensure content is appropriate to the intended recipients, was provided to relevant Traditional Custodian groups (**Appendix F, reference 1.26**). and phone calls to provide context to the consultation made.
- Ongoing efforts were made to engage and develop relationships with these bodies via a variety of means such as email, phone calls, alternative contacts, texts, social media and in some cases physical visits.
- Consultation meetings with attendees decided by Traditional Custodian groups, supported by senior Woodside representatives, subject matter experts, First Nations Relations advisers with skills and experience in community engagement. Meetings are developed through a two-way consultation process to ensure effective information sharing via:
  - Mutually agreed agenda avoiding time pressure;
  - Encouraging Traditional Custodian attendees to control the pace of the meeting and pause at any time to ask questions, seek clarification or provide feedback;
  - Visual aids such as posters, presentations, simplified technical videos and real-world pictures and footage;
  - Emphasis on potential planned and unplanned risks and impacts of the activity;
  - Ample opportunity for questions and feedback;
  - Discussion about ongoing relationship development and opportunities;
  - Distribution of hard-copy Consultation Information Sheets (**Appendix F, reference 1.25**) and Summary Consultation Information Sheets (**Appendix F, reference 1.26**);
  - Meeting all costs such as sitting fees, travel, legal support and executive support and other support required.
- Woodside has a geotargeted sponsored social media campaign (**Appendix F, reference 1.91**) to various communities that are coastally adjacent to the EMBA for the proposed activities.
  - The wide-reaching campaign brought the proposed activity to the attention of persons who may be interested and advised persons or organisations how they can find out about Woodside's proposed activities by visiting Woodside's website, which details the intent of consultation with relevant persons under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth). The reach of this campaign is shown in **Appendix F, reference 1.91**), providing the opportunity to consult via over 139,000 views to date across various regions.

- These social media posts were developed with input from Indigenous representatives. Social media is a highly effective means to engage Indigenous audiences as outlined in Indigenous Digital Life (Professor Carlson, 2021). Advertisements used language and information appropriate to Indigenous audiences. Feedback from community engagements indicates a high level of penetration for this technique.

Woodside has employed a diverse range of techniques to allow relevant persons to become aware of the proposed activity and how it may affect their functions activities or interests, and understand their ability to provide feedback. The combination of engagement meetings, traditional print media, social media and face-to face community interaction was designed with input from Indigenous representatives and adapted to the audience, so that it provides a wide-ranging opportunity to consult.

# 6 ENVIRONMENTAL RISK ASSESSMENT, PERFORMANCE OUTCOMES, STANDARDS AND MEASUREMENT CRITERIA

## 6.1 Overview

This section presents the impact and risk analysis, evaluation and Environment Performance Outcomes (EPOs), Environmental Performance Standards (EPS) and Measurement Criteria (MC) for the Petroleum Activities Program, using the methodology described in **Section 2** of this EP.

### 6.1.1 Cumulative Impacts

The Scarborough OPP (SA0006AF0000002, Rev 5; Section 8) assesses the potential cumulative impact of the Scarborough Project and other activities / developments. In addition, Woodside has assessed the cumulative impacts of the Petroleum Activities Program in relation to other relevant petroleum activities, including other Scarborough activities, that could realistically result in overlapping temporal and spatial extents.

Other facilities located in proximity to the PAA were identified within **Section 4.9.8**. Given the distance between the location of the PAA and other nearby petroleum facilities and activities, no cumulative risks or impacts will credibly occur.

Woodside has also identified and assessed the following proposed activities for WA-61-L that may overlap temporally and/or spatially:

- Scarborough 4D B1 marine seismic survey may be undertaken over WA-61-L however there will be no temporal overlap (activities will not occur concurrently) and therefore no cumulative impacts are predicted with this activity.
- Scarborough trunkline installation may result in cumulative impacts due to both a spatial and temporal overlap, however any potential impacts will be described, assessed and managed under the Scarborough Seabed Intervention and Trunkline Installation EP (under development).
- Fibre optic cable installation in WA-61-L may be undertaken during the timing of the Petroleum Activities Program. However given that the distance between activities in this EP and fibre optic cable installation activities would be at least 10 km, no cumulative risks or impacts will credibly occur.

Where relevant the cumulative impacts of activities associated with undertaking multiple concurrent or parallel activities of this Petroleum Activities Program have been assessed in **Sections 6.7**, **6.8** and **6.10.**

## 6.2 Impact and Risk Analysis and Evaluation

As required by Regulations 13(5) and 13(6) of the Environment Regulations, the following analysis and evaluation demonstrates that the identified impacts and risks associated with the Petroleum Activities Program are reduced to ALARP, are of an acceptable level and consider all operations of the activity, including potential emergency conditions. The impact assessment for planned activities has been based on the size of the PAA.

The impacts and risks identified during the ENVID workshops (including decision type, current risk level, acceptability of impacts and risks, and tools used to demonstrate acceptability and ALARP) have been divided into two broad categories:

- Planned activities (routine and non-routine) that have the potential for inherent environmental impacts; and

- Unplanned events (accidents, incidents or emergency situations) with an environmental consequence, termed risks.

Within these categories, impact and risk assessment groupings are based on environmental aspects such as emissions and physical presence. In all cases, the worst-case risk was assumed.

The ENVID (performed in accordance with the methodology described in **Section 2**) identified 16 sources of environmental impacts and risks. A summary of the ENVID is provided in Table 6-1.

The Scarborough Drilling and Completions specific ENVID workshop was conducted on 18 May 2021. Attendees included: Superintendent (Drilling and Completions), Environmental Advisers, Environmental Scientists, Environmental Engineers, Lead Drilling Engineer, Hydrocarbon Spill Adviser, and Environmental Consultants.

The impact and risk analysis and evaluation for the Petroleum Activities Program indicates that all current environmental risks and impacts associated with the individual activities are reduced to ALARP and are of an acceptable level, as discussed further in **Sections 6.7**, **6.8** and **6.10.**

**Table 6-1: Environmental Impact and Risk analysis and summary**

| Aspect | EP Section | Risk Rating | | | | Acceptability |
|---|---|---|---|---|---|---|
| | | Impact/ Consequence | Potential Impact/Consequence Level | Likelihood | Current Risk Rating | |
| ***Planned Activities (Routine and Non-routine)*** | | | | | | |
| Routine Light Emissions: External Lighting on MODU and Project Vessels | **6.7.1** | E | Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Routine Atmospheric and Greenhouse Gas Emissions | **6.7.2** | F | Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Routine Acoustic Emissions – Generation of Noise from MODU, Project Vessels and Positioning Equipment | **6.7.3** | E | Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Physical Presence – Interaction with other marine users | **6.7.4** | E | Slight, short-term impact (<1 year) to a community or area/item of cultural significance. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Physical Presence – Disturbance to Benthic Habitat from MODU Anchoring, Drilling Operations, Subsea Installation and ROV Operations | **6.7.5** | D | Environment – Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Routine and Non-Routine Discharges: MODU and Project Vessels | **6.7.6** | E | Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |

| Aspect | EP Section | Risk Rating | | | | Acceptability |
|---|---|---|---|---|---|---|
| | | Impact/ Consequence | Potential Impact/Consequence Level | Likelihood | Current Risk Rating | |
| Routine and Non-Routine Discharges: Drill Cuttings and Drill Fluids | **6.7.7** | D | Environment – Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Routine and Non Routine Discharges: Cement, Cementing Fluids, Subsea Well Fluids, Produced Water and Unused Bulk Product | **6.7.8** | D | Environment – Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute. | - | - | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| ***Unplanned Activities (Accidents, Incidents, Emergency Situations)*** | | | | | | |
| Unplanned Hydrocarbon Release: Vessel Collision | **6.8.2** | D | Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute. | 1 | M | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Unplanned Hydrocarbon Release: Loss of Well Integrity | **6.8.3** | D | Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute. | 1 | M | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Unplanned Discharge: Chemicals and Hydrocarbons | **6.8.4** | E | Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. | 1 | L | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Unplanned Hydrocarbon Release: Bunkering | **6.8.5** | D | Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. | 1 | M | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Unplanned Discharge: Hazardous and Non – Hazardous Solid Waste | **6.8.6** | D | Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute. | 0 | L | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |

| Aspect | EP Section | Risk Rating | | | | Acceptability |
|---|---|---|---|---|---|---|
| | | Impact/ Consequence | Potential Impact/Consequence Level | Likelihood | Current Risk Rating | |
| Physical Presence (Unplanned): Seabed Disturbance | **6.8.7** | D | Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute. | 1 | M | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Physical Presence (Unplanned): Invasive Marine Species | **6.8.8** | E | Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. | 0 | L | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |
| Physical Presence (Unplanned): Collision with Marine Fauna | **6.8.9** | E | Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. | 1 | L | Broadly Acceptable<br>Has been shown to meet requirements listed in **Section 2.3.5** |

## 6.3 Environmental Performance Outcomes, Standards and Measurement Criteria

Regulation 13(7) of the Environment Regulations requires that an EP includes Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria (MC) that address legislative and other controls to manage the environmental risks of the activity to ALARP and acceptable levels.

The EPOs, EPSs and MC specified are consistent with legislative requirements and Woodside's standards and procedures. They have been developed based on the Codes and Standards, Good Industry Practices and Professional Judgement outlined in **Sections 2.3.2** and **2.3.3** as part of the acceptability and ALARP justification process.

During consultation, a summary of the controls adopted to manage the impacts and risks from the activity is included in the Consultation Information Sheet (Appendix F, 1.1) which is provided directly to relevant persons and available on the Woodside website.

In addition, during face-to-face consultation with Traditional Custodians, the particular controls adopted to manage interests raised are typically discussed by appropriate SMEs at the meeting to seek feedback. These controls may also be jointly adopted to protect the ecological value of a receptor. If additional controls are considered, to manage the risk to identified cultural values, these are discussed with the relevant persons who have raised the value.

Controls which have been adopted to manage the risk to a cultural value identified from literature or which are adaptive in nature may not have not been routinely tested during consultation with traditional custodians, unless the values has been identified by the relevant person themselves. It is not considered appropriate to broadly canvass Traditional Custodian relevant persons to validate cultural values identified from literature (not raised by the relevant person themselves) or associated controls. Instead, Woodside's in-house heritage and First Nations experts have been involved in developing and screening such controls. The EPOs, EPSs and MC are presented throughout this section and in **Appendix D** (Oil Spill Preparedness and Response). A breach of these EPOs or standards constitutes a 'Recordable Incident' under the Environment Regulations (refer to **Section 7.10.4**).

The Scarborough OPP identified the impacts and risks associated with the proposed development and defined suitable high-level EPOs. The OPP EPOs have been cascaded to the relevant project activities under this EP and the relationship between OPP EPOs and those developed in this EP is summarised in **Table 6-2.**

For the physical and biological receptors within the EMBA, Woodside has set EPOs that are consistent with the *Matters of National Environmental Significance – Significant impact guidelines 1.1* (DoE, 2013). For social receptors, including fishing and other commercial activities, the EPOs that have been set reflect the requirements in the OPGGS Act Section 280(2), in that the activities undertaken as a part of the development of Scarborough should not interfere with other marine users, to a greater extent than is necessary for the exercise of right conferred by the titles granted.

The EPOs for all environmental impacts/risks are identified and summarised in **Table 6-2.**

**Table 6-2: Comparison of EP EPOs to the relevant OPP EPOs**

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| ***Planned Activities*** | | | |
| **Section 6.7.1**<br>Routine Light Emissions: External Lighting on MODU and Project Vessels | **EPO 1**<br>Undertake the Petroleum Activities Program in a manner that will not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results. | **EPO 1.1; EPO 4.1; EPO 6.4; EPO 6.8; EPO 11.5, EPO 12.4; EPO13.4; EPO 15.6; EPO 16.2; EPO 17.2; EPO 18.2:** | The EPOs adopted in the EP for routine light emissions are consistent with the EPOs in the OPP. |
| | **EPO 2**<br>Undertake the Petroleum Activities Program in a manner that will not have a substantial adverse effect on a population of seabirds or shorebirds, or the spatial distribution of the population. | **EPO 1.2; EPO 15.3** | |
| | **EPO 3**<br>Undertake the Petroleum Activities Program in a manner that will not seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species. | **EPO 1.4; EPO 4.3; EPO 10.6; EPO 15.9; EPO 18.5** | |
| | **EPO 4**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of fishes, marine mammals, marine reptiles, or the spatial distribution of a population. | **EPO 4.2; EPO 15.7; EPO 18.4** | |
| **Section 6.7.2**<br>Routine Atmospheric and Greenhouse Gas Emissions | **EPO 5**<br>Undertake the Petroleum Activities Program in a manner that will not result in a substantial change in air quality which may adversely impact on biodiversity, ecological integrity social amenity or human health. | **EPO 2.1** | **New EPO –** EPO 6 relating to Atmospheric and GHG emissions to be inclusive of all emissions relevant to this Petroleum Activities Program.<br>This EPO was updated during EP assessment |
| | **EPO 6**<br>Assess opportunities to improve energy efficiency and reduce GHG emissions from the Petroleum Activities Program. | **New EPO** | |

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| **Section 6.7.3**<br>Routine Acoustic Emissions – Generation of Noise from MODU, Project Vessels and Positioning Equipment | **EPO 3**<br>Undertake the Petroleum Activities Program in a manner that will not seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species. | **EPO 1.4; EPO 4.3; EPO 10.6; EPO 15.9; EPO 18.5** | The EPOs adopted in the EP for routine noise emissions are consistent with the EPOs in the OPP. |
| | **EPO 4**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of fishes, marine mammals, marine reptiles, or the spatial distribution of a population. | **EPO 4.2; EPO 15.7; EPO 18.4:** | |
| | **EPO 8**<br>Undertake the Petroleum Activities Program in a manner that will not substantially modify, destroy or isolate an area of important habitat for a migratory species. | **EPO 1.3; EPO 10.5; EPO 15.8** | |
| **Section 6.7.4**<br>Physical Presence – Interaction with Other Marine Users | **EPO 9**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on the sustainability of commercial fishing. | **EPO 5.1** | The EPOs adopted in the EP for interaction with other marine users are consistent with the EPOs in the OPP. |
| | **EPO 10**<br>Undertake the Petroleum Activities Program in a manner that does not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted. | **EPO 5.2** | |
| **Section 6.7.5**<br>Physical Presence – Disturbance to Benthic Habitat from MODU Anchoring, Drilling Operations, | **EPO 1**<br>Undertake the Petroleum Activities Program in a manner that will not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results. | **EPO 1.1; EPO 4.1; EPO 6.4; EPO 6.8; EPO 11.5, EPO 12.4; EPO13.4; EPO 15.6; EPO 16.2; EPO 17.2; EPO 18.2:** | The EPOs adopted in the EP for the disturbance to benthic habitat are consistent with the EPOs in the OPP. |

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| Subsea Installation and ROV Operations | **EPO 11**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial change to water quality that may adversely impact on biodiversity, ecological integrity, social amenity or human health. | **EPO 6.1; EPO 7.1; EPO 8.1; EPO 9.1; EPO 10.1; EPO12.1; EPO 13.1; EPO 15.2** | |
| | **EPO 28**<br>No adverse impact to unexpected finds of Underwater Cultural Heritage without a permit[28]. | **New EPO** | |
| **Section 6.7.6**<br>Routine and Non-Routine Discharges: MODU and Project Vessels | **EPO 11**<br>Undertake the Petroleum Activities Program activities in a manner that does not result in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health | **EPO 6.1; EPO 7.1 ; EPO 8.1 ; EPO 9.1; EPO 10.1; EPO12.1; EPO 13.1; EPO 14.1; EPO 15.2** | The EPOs adopted in the EP for MODU and project vessel discharges are consistent with the EPOs in the OPP. |
| | **EPO 12**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of plankton including its life cycle and spatial distribution. | **EPO 10.2; EPO 11.3; EPO 12.3; EPO 13.3** | |
| | **EPO 13**<br>Undertake the Petroleum Activities Program in a manner which does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity an area defined as a Key Ecological Feature. | **EPO 10.8; EPO 11.6; EPO 12.5; EPO 13.6; EPO 16.3** | |
| **Section 6.7.7**<br>Routine and Non-Routine Discharges: Drill cuttings and drilling fluids | **EPO 1**<br>Undertake Petroleum Activities Program in a manner that does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results. | **EPO 1.1; EPO 4.1; EPO 6.4; EPO 6.8; EPO 11.5, EPO 12.4; EPO 13.4; EPO 15.6; EPO 16.2; EPO 17.2; EPO 18.2** | The EPOs adopted in the EP for the drilling discharges are consistent with the EPOs in the OPP. |

[28]Permit for Entry into a Protected Zone or to Impact Underwater Cultural Heritage would be acquired under the UCH Act.

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| | **EPO 11**<br>Undertake Petroleum Activities Program in a manner that does not result in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health. | **EPO 6.1; EPO 7.1 ; EPO 8.1 ; EPO 9.1; EPO 10.1; EPO12.1; EPO 13.1; EPO 14.1; EPO 15.2** | |
| | **EPO 12**<br>Undertake Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of plankton including its life cycle and spatial distribution. | **EPO 10.2; EPO 11.3; EPO 12.3; EPO 13.3** | |
| | **EPO 13**<br>Undertake the Petroleum Activities Program in a manner which does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity an area defined as a Key Ecological Feature. | **EPO 10.8; EPO 11.6; EPO 12.5; EPO 13.6; EPO 16.3** | |
| | **EPO 14**<br>Undertake Petroleum Activities Program in a manner that prevents substantial change in sediment quality, which may adversely impact biodiversity, ecological integrity, social amenity or human. | **EPO 13.2** | |
| | **EPO 15**<br>Undertake Petroleum Activities Program in a manner that prevents significant impacts on the values of the Exmouth Plateau KEF. | **EPO 10.3; EPO 11.4; EPO 13.5** | |
| **Section 6.7.8**<br>Routine and Non-Routine Discharges: Cement, Cementing Fluids, Subsea Well Fluids, Produced Water and Unused Bulk Product | Same as **Section 6.7.7** above | | |
| ***Unplanned Activities*** | | | |

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| **Section 6.8.2**<br>Unplanned Hydrocarbon Release: Vessel Collision | **EPO 16**<br>No release of hydrocarbons to the marine environment due to a vessel collision associated with the Petroleum Activities Program. | **EPO 19.1** | The EPOs adopted in the EP for an unplanned hydrocarbon release from a vessel collision are consistent with the EPOs in the OPP. |
| **Section 6.8.3**<br>Unplanned Hydrocarbon Release: Loss of Well Control | **EPO 17**<br>No loss of well control resulting in loss of hydrocarbons to the marine environment during the Petroleum Activities Program | **New EPO** | This EPO is new to this EP, and is consistent with both the wording of previous Woodside Environment Plans and the intent of EPO 19.1 in the OPP. |
| **Section 6.8.4**<br>Unplanned Discharge: Chemicals and Hydrocarbons | **EPO 18**<br>Undertake the Petroleum Activities Program in a manner that will prevent an unplanned release of chemicals or non-process hydrocarbons to the marine environment resulting in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health. | **EPO 14.1** | The EPOs adopted in the EP for an unplanned hydrocarbon release from bunkering are consistent with the EPOs in the OPP. |
| **Section 6.8.5**<br>Unplanned Hydrocarbon Release: Bunkering | Same as **Section 6.8.4** above | | |
| **Section 6.8.6**<br>Unplanned Discharge: Hazardous and Non – Hazardous Solid Waste | **EPO 2**<br>Undertake Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of seabirds or shorebirds, or the spatial distribution of the population | **EPO 1.2; EPO 15.3** | The EPOs adopted in the EP for an unplanned discharge of hazardous and non-hazardous solid wastes are consistent with the EPOs in the OPP. |
| | **EPO 3**<br>Undertake Petroleum Activities Program in a manner that will not seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species. | **EPO 1.4; EPO 4.3; EPO 10.6; EPO 15.9; EPO 18.5** | |

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| | **EPO 4**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of fishes, marine mammals, marine reptiles, or the spatial distribution of a population. | **EPO 4.2; EPO 15.7; EPO 18.4** | |
| | **EPO 8**<br>Undertake Petroleum Activities Program in a manner that will not substantially modify, destroy or isolate an area of important habitat for a migratory species. | **EPO 1.3; EPO 10.5; EPO 15.8** | |
| | **EPO 11**<br>Undertake Petroleum Activities Program in a manner that will prevent a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health. | **EPO 6.1; EPO 7.1; EPO 8.1; EPO 9.1; EPO 10.1; EPO12.1; EPO 13.1; EPO 14.1; EPO 15.2** | |
| | **EPO 19**<br>Undertake Petroleum Activities Program in a manner that will prevent an unplanned release of solid waste to the marine environment resulting in a significant impact | **EPO 15.1** | |
| | **EPO 20**<br>Undertake Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of fish, or the spatial distribution of the population. | **EPO 10.4; EPO 15.4** | |
| | **EPO 21**<br>Undertake Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of marine mammals or the spatial distribution of the population. | **EPO 10.7; EPO 15.5; EPO 18.3** | |
| **Section 6.8.7**<br>Physical Presence (Unplanned): Seabed Disturbance | **EPO 13**<br>Undertake the Petroleum Activities Program in a manner which does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in an area defined as a Key Ecological Feature. | **EPO 10.8; EPO 11.6; EPO 12.5; EPO 13.6; EPO 16.3** | The EPOs adopted in the EP for unplanned seabed disturbance are consistent with the EPOs in the OPP. |

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| | **EPO 22**<br>Undertake the Petroleum Activities Program in a manner which prevents unplanned seabed disturbance. | **EPO 16.1** | |
| **Section 6.8.8**<br>Physical Presence (Unplanned): Invasive Marine Species | **EPO 13**<br>Undertake the Petroleum Activities Program in a manner which does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in an area defined as a Key Ecological Feature. | **EPO 10.8; EPO 11.6; EPO 12.5; EPO 13.6; EPO 16.3** | OPP EPO's 17.1, 17.3 and 17.4 have been combined to form one EPO which encompasses the intent and outcome of all three. |
| | **EPO 23**<br>Undertake the Petroleum Activities Program in a manner which prevents a known or potential pest species (IMS) becoming established. | **EPO 17.1, EPO 17.3, EPO 17.4** | |
| **Section 6.8.9**<br>Physical Presence (Unplanned): Collision with Marine Fauna | **EPO 26**<br>Undertake the Petroleum Activities Program in a manner which prevents a vessel strike with protected marine fauna during project activities. | **EPO 18.1** | The EPOs adopted in the EP for the unplanned collision with marine fauna are consistent with the EPOs in the OPP. |
| | | | |
| **Section 6.10**<br>Cultural Features and Heritage Values Assessment | **EPO 27**<br>Woodside will actively support Traditional Custodians' capacity for ongoing engagement and consultation on environment plans for the purpose of avoiding impacts to cultural heritage values. | **EPO 5.2** | **New EPO –** This EPO was updated during EP assessment |
| | **EPO 28**<br>New cultural values identified through the Program and supporting studies (**EPO 27**) will be managed to ALARP and an Acceptable level of impact. | | |

| Aspect | EPOs in this EP | Relevant EPOs from the Scarborough OPP | Comparison |
|---|---|---|---|
| | **EPO 29**<br>No impact to known cultural features and heritage value, as stated in Table 4-18, greater than a consequence level of F[29] from the Petroleum Activities Program. | | |

[29] Defined as F – Negligible, no lasting effect (< 1 month) Localised impact not significant to areas /items of cultural significance

## 6.4 Presentation

The environmental impact and risk analysis and evaluation (ALARP and acceptability), EPOs, standards and MC are presented in the following tabular form throughout this section. Italicised text in the following example denotes the purpose of each part of the table with reference to the relevant sections of the Environment Regulations and/or this EP.

| **Scarborough OPP – Relevant Impact Assessment Section** | | |
|---|---|---|
| *<Reference to section number in the Scarborough Project OPP>* | | |
| **Context <Description of the context for the impact/risk. Regulation 13(1, 13(2) and 13(3)>** | | |
| **Relevant Activities**<br>Source of Aspect – **Section reference**<br>*Description of the Activity – Regulation 13(1)* | **Existing Environment**<br>Relevant environment – **Section reference**<br>*Description of the Environment – Regulations 13(2)(3)* | **Consultation**<br>Consultation – **Section reference**<br>*Consultation – Regulation 11A* |

| **Impact/Risk Evaluation Summary** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Environmental Value Potentially Impacted***<br>Regulations 13(2)(3) | | | | | | | ***Evaluation*** | | | | | | |
| ***Source of Impact/Risk***<br>Regulation 13(1) | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| *Summary of source of risk/impact* | | | | | | | | | | | | | | |

| **Description of Source of Impact/Risk** |
|---|
| *Description of the identified impact/risk including sources or threats that may lead to the risk or identified event. Regulation 13(1).* |

| **Detailed Impact Assessment** |
|---|
| ***Assessment of Potential Impacts*** |
| ***Receptor***<br><u>Impact / risk</u><br>Assessment of potential impact<br>*Discussion and assessment of the potential impacts to the identified environment value(s). Regulations 13(5)(6).*<br>*Potential impacts to environmental values have been assigned and discussed based on Woodside's Environmental Consequence Definitions for Use in Environmental Risk Assessments (**Figure 2-1**).* |
| ***Cumulative Impacts*** |
| *Description of any cumulative impacts specific to the PAA (cumulative impact assessment of Scarborough project as a whole is covered in the OPP)* |
| ***Summary of Assessment Outcomes*** |

| **Receptor** | **Impact** | **Receptor Sensitivity Level** | **Magnitude** | **Impact Significance Level / Risk Consequence** |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | | | | |

***Overall Impact Significance Level/ Risk consequence:*** *Roll up to Impact/consequence rating (in impact/risk evaluation summary at top of this table) but need to look at individual receptors as being equal to or less than level of acceptability in the OPP.*

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***ALARP Tool Used – Section 2.3.4*** | | | | |
| *Summary of control considered to ensure the impacts and risks are continuously reduced to ALARP.*<br>*Regulation 13(5)(c).* | *Technical/logistical feasibility of the control.*<br>*Cost/sacrifice required to implement the control (qualitative measure).* | *Quantum of impact/risk that could be averted (measured in terms of reduction of likelihood, consequence and current risk rating) if the cost/sacrifice is made and the control is adopted.* | *Proportionality of cost/sacrifice vs environmental benefit. If proportionate (benefits outweigh costs) the control will be adopted. If disproportionate (costs outweigh benefits) the control will not be adopted.* | *If control is adopted: Reference to Control # provided.* |

**ALARP Statement:**

*Made on the basis of the environmental risk assessment outcomes, use of the relevant tools appropriate to the decision type (**Section 2.3.3** and **Figure 2-3**) and a proportionality assessment. Regulation 10A(b).*

| **Demonstration of Acceptability** |
|---|
| ***Acceptability Criteria and Assessment*** |
| • *Impact Significance Level / Risk Consequence levels for receptors are within acceptable bounds of the OPP*<br>• *Adoption of relevant OPP EPOs and controls*<br>• *Internal/external context and other requirements specific to this EP Petroleum Activities Program* |
| ***Acceptability Statement:***<br>*Outcomes of the impact assessment in comparison to OPP and ALARP demonstration.* |

| **Environmental Performance Outcomes, Standards and Measurement Criteria** | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO#**<br>S: *Specific performance which addresses the legislative and other controls that manage the activity and against which performance by Woodside in protecting the environment will be measured.*<br>M: *Performance against the outcome will be measured by measuring implementation of the controls via the measurement criteria.* | **C#** *Identified control adopted to ensure the impacts and risks are continuously reduced to ALARP.*<br>*Regulation 13(5)(c).* | *PS# Statement of the performance required of a control measure. Regulation 13(7)(a)* | *MC# Measurement criteria for determining whether the outcomes and standards have been met. Regulation 13(7)(c)* |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| A: *Achievability/feasibility of the outcome demonstrated via discussion of feasibility of controls in ALARP demonstration. Controls are directly linked to the outcome.*<br>R: *The outcome will be relevant to the source of risk and the potentially impacted environmental value.*<br>T: *The outcome will state the timeframe during which the outcome will apply or by which it will be achieved.* | | | |

## 6.5 Potential Environment Risks Not Included Within the Scope of this Environment Plan

The ENVID identified environmental risks that were assessed as not being applicable within or outside the PAA as a result of the Petroleum Activities Program and, therefore, were determined to not form part of this EP. These are described in the next sections for information only.

### 6.5.1 Shallow/Near-shore Activities

The Petroleum Activities Program is located in water depths greater than 100 m and at a significant distance from nearest landfall (Montebello Islands). Consequently, risks associated with shallow/ near-shore activities such as vessel anchoring, and risks of grounding were assessed as not credible.

### 6.5.2 Generation of Noise from Flaring and Helicopters

It is not credible that airborne noise from flaring and helicopter transfers would add to levels of underwater noise emanating from the MODU, project vessels and positioning equipment to any extent. Similarly, it is not credible that noise from ROV operations at the seabed in ~900 m water depth would add to levels of noise emanating from the MODU and project vessels just below the sea surface, or noise emissions from transponders on the seabed, to any extent. Noise emissions from these other sources would not add to cumulative sound fields from MODU, project vessel and transponders to any discernible extent. As such noise emissions from these sources has not been considered in **Section 6.7.3**.

## 6.6 Indirect Impacts

For the proposed Scarborough Drilling and Completions activity, the potential 'indirect' environmental impacts and risks evaluated are those associated with mobilisation/demobilisation of the MODU and project vessels to the PAA, which have been considered in the environmental impact assessment in **Sections 6.7 and 6.8**.

Due to the nature and scale of these potential indirect environmental impacts and risks (such as fuel usage, interaction with other marine users and usual vessel discharges), and the regulatory frameworks and applicable maritime regulations in place to manage them, Woodside considers the potential impacts and risks from mobilisation and demobilisation of the MODU and project vessels to be inherently ALARP in its current state. Therefore, Woodside considers that standard vessel and

MODU operations are appropriate to manage the potential impacts and risks from mobilisation and demobilisation of the MODU and project vessels to a level that is acceptable.

The extraction of Scarborough gas for onshore processing is not included in this Petroleum Activities Program. Subsequent and future petroleum activities must first be authorised under the OPGGS(E)R and implemented before Scarborough gas is able to be extracted for onshore processing. Therefore, any indirect impacts and risks arising from the onshore processing of Scarborough gas are not considered indirect impacts/risks of this Petroleum Activities Program, but will be evaluated in future Scarborough EPs as appropriate. **Section 1.10.2.1** outlines the list of broader Scarborough Development activities, which will be addressed in EPs submitted to NOPSEMA for assessment.

## 6.7 Planned Activities (Routine and Non-Routine)

### 6.7.1 Routine Light Emissions: External Lighting on MODU and Project Vessels

| **Scarborough OPP – Relevant Impact Assessment Section** | | |
|---|---|---|
| Section 7.1.1 – Routine Light Emissions | | |
| **Context** | | |
| **Relevant Activities**<br>Well Flowback – **Section 3.8.5**<br>Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1**<br>Contingency Activities – **Section 3.10** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2**<br>Protected Species – **Section 4.6** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| External light emissions on board MODU and vessels | | | | | | ✓ | | A | E | - | - | GP | Broadly Acceptable | EPO 1, 2, 3, 4 |

**Description of Source of Impact/Risk**

***Vessel and MODU Operations***

Vessels and the MODU will have external lighting to support safe navigation and safe operations at night. This lighting typically consists of bright white (i.e. metal halide, halogen, fluorescent) lights, and is not dissimilar to lighting used for other offshore activities, including fishing and shipping.

Lighting is required for the safe operation of the MODU and vessels and cannot reasonably be eliminated.

The extent of this potential impact for the Petroleum Activities Program is restricted to the line of sight for each activity emitting light (**Table 6-3**), which based on previous work undertaken by Woodside is about 30 km from the MODU during drilling activities and 30 km from vessels. For well flowback, specifically flaring, the distance at which the flare will be visible is expected to be less than 50 km from the source, and potentially around 10 km further during emergency flaring (Woodside, 2011, 2014).

**Table 6-3: Extent of potential impact from light sources associated with Scarborough**

| Activity | Estimated visual line of sight | Reference |
|---|---|---|
| Vessel operations | 30 km | Woodside, 2014 |
| MODU operations | 30 km | Woodside, 2014 |
| Well flowback (flaring) | 50 km (+ 10 km during emergency flaring) | Woodside, 2011 |

While the line of sight may extend tens of kilometres from the source, the light density (measured in Lux – which represents the intensity of light that arrives at or leaves a surface, as perceived by the human eye) rapidly decreases as distance increases from the source of the light. Monitoring undertaken as a part of Woodside's 2014 study indicated that light density (from navigational lighting) attenuated to below 1.00 Lux and 0.03 Lux at distances of 300 m and 1.4 km, respectively, from the source (a MODU). Light densities of 1.00 and 0.03 Lux are comparable to natural light densities experienced during deep twilight and during a quarter moon. Navigational lighting from vessels

is less than lighting on a MODU. Therefore, light emissions from the MODU and vessels are expected to be below 1.00 Lux within 300 m from the source.

Note that flaring, which is a relatively bright light source, may occur during well unloading.

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

***Ambient Light***

The introduction of light emissions from activities associated with the Petroleum Activity Program can result in a temporary change to ambient light.

The area of operation is at a significant distance from coastal sources of light emissions. However, there are existing activities in the region which also generate light including offshore facilities and supporting activities, as well as shipping traffic.

The contribution of light emissions from the Petroleum Activities Program will be comparable with existing vessels and facilities on the North West Shelf and will not result in a notable increase.

Given the distance from shore, low sensitivity of receptors offshore (i.e. no presence of nesting turtles and low likelihood of hatchling turtles in the offshore environment), and the negligible contribution of light emissions to the environment from the Petroleum Activities Program, the habitat or ecosystem function or integrity of the marine area will not be impacted. Potential impacts of changes to ambient light are included in a number of recovery plans and conservation advice, including the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) and the Wildlife Conservation for Migratory Shorebirds (Commonwealth of Australia, 2015b).

The National Light Pollution Guidelines for Wildlife (NLPG) addresses potential impacts to marine turtles, seabirds and migratory shorebirds from artificial light (Commonwealth of Australia, 2020). The guidelines recommend a specific artificial light impact assessment process where there is important habitat for listed species that are known to be affected by artificial light within 20 km of a project. The 20 km threshold provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15–18 km (Kamrowski, et al., 2014; Hodge et al., 2007) and fledgling seabirds grounded in response to artificial light 15 km away (Rodríguez et al., 2014). The PAA is about 215 km offshore and outside known BIAs for turtles and seabirds/migratory shorebirds, therefore a specific assessment of potential impacts of artificial lighting is not required under the NLPG.

***Seabirds***

High levels of marine lighting can attract and disorient seabird species resulting in species behavioural changes (e.g. circling light sources or disrupted foraging), injury or mortality near the light source (e.g. Longcore and Rich, 2004; Gaston et al., 2014; Rich and Longcore, 2006). As the PAA is offshore and away from islands or other emergent features, any presence of seabirds or shorebirds is considered likely to be of a transient nature only. The nearest BIA for birds within the EMBA is a breeding and foraging BIA for the wedge-tailed shearwater, located 115 km to the south-east of the PAA. Impacts to shearwaters within the BIA are therefore not expected.

Behavioural disturbance to birds from light is expected to be localised to within the vicinity of the MODU and vessels within the permit areas. The light source from the MODU and vessels within the PAA will be temporary and only when operations are occurring. Interactions with seabirds are therefore expected to be unlikely. Any impacts are predicted to be at an individual level and not a population level. The temporary behavioural disturbance of birds will be localised around the light sources, and not result in a substantial adverse effect on a population of species or its lifecycle. Additionally, light emissions will not seriously disrupt the lifecycle of an ecologically significant proportion of any migratory birds.

Based on the detailed evaluation, the magnitude of impacts to birds from light emissions during activities associated with the Petroleum Activities Program is expected to have no lasting effect.

***Marine Reptiles***

Exposure of marine turtles to artificial light can result in changes to their natural behaviour. Witherington and Martin (2003) state that light pollution on nesting beaches is detrimental to marine turtles because it alters critical nocturnal behaviours, namely, how turtles choose nesting sites, how they return to the sea after nesting, and how hatchlings find the sea after emerging from their nests. However, there are no sensitive marine turtle habitats near the PAA. The closest known turtle nesting beaches are at the North West Cape and Montebello Islands, located about 215 km and 225 from the PAA respectively. Marine turtles generally have a pelagic life stage as juveniles, before returning to nearshore coastal habitats as adults to forage and breed. At the PAA, marine turtles are unlikely to occur due to the deep waters (>900 m) however, they may occur offshore in small numbers. Leatherback turtles are an oceanic, pelagic species known to regularly forage within continental shelf waters. While leatherback turtles may occur in the PAA in small numbers, their distribution is widespread in Australia and their presence is unlikely. No turtles were observed during the winter or summer offshore marine surveys in the PAA (ERM, 2013).

While artificial lighting may be visible up to tens of kilometres away from the MODU/vessels, the light intensity will be low beyond several hundred metres from the light sources as described above. Although individuals undertaking behaviours such as migration or foraging (adults and pelagic juveniles) may occur within the PAA, marine turtles do

not use light cues to guide these behaviours. Furthermore, there is no evidence, published or anecdotal, to suggest that foraging or migrating turtles are impacted by light from offshore vessels. As such, light emissions from the project vessels/MODU are unlikely to result in displacement of, or behavioural changes to individuals in these life stages

Any hatchlings within the PAA, due to the distance offshore the density of any hatchlings is expected to be very low and limited to individuals, may temporarily alter their normal behaviour if attracted to the light spill from vessel and MODU operations. For any isolated individuals potentially attracted to light spill from project vessels/MODU, following sunrise, any effect of these light sources on hatchlings will be eliminated allowing dispersal behaviour to resume.

As described above, behavioural disturbance to turtles from light in the PAA is expected to be localised to within the vicinity of the MODU and vessels within the Permit Area. The light source from the MODU and vessels within the PAA will be temporary and interaction with turtles is expected to be low. Therefore, any impacts are predicted to be at an individual level and not a population level. Impacts will not occur to significant proportions of the populations of the species, nor result in a decrease of the quality of the habitat such that the extent of these species is likely to decline.

Based on the detailed evaluation, the magnitude of impacts to marine turtles from light emissions during activities associated with the Petroleum Activities Program is evaluated to have no lasting effect.

| ***Summary of Assessment Outcomes*** | | | | |
|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity Level** | **Magnitude** | **Impact Significance Level** |
| Ambient Light | Change in ambient light | Low value (open water) | Slight | Negligible (F) |
| Seabirds and migratory shorebirds | Change in fauna behaviour | High value species (e.g. wedge-tailed shearwater) | No lasting effect | Slight (E) |
| Marine reptiles | | High value species (e.g. flatback turtle) | No lasting effect | Slight (E) |
| ***Overall Impact Significance Level:*** The overall impact significance level for routine light emissions is E based on no lasting effect to the high value receptors (seabirds, migratory shorebirds and marine turtles). The impact significance levels for individual receptors are consistent with the level in the OPP. | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| No additional controls identified. | | | | |
| ***Good Practice*** | | | | |
| Lighting will be limited to the minimum required for navigational and safety requirements, with the exception of emergency events. | F: Yes. Lighting is typically appropriate for navigation and safety. | Given the potential impacts to turtles during this activity is insignificant, implementation of this control would not result in a reduction in consequence. | While the control does not result in significant reduction of impacts, it is good practice and not at significant cost. | **C 1.1** |
| ***Professional Judgement – Eliminate*** | | | | |
| Substitute external lighting with ‘‘turtle friendly’’ light sources (reduced emissions in turtle visible spectrum). | F: Yes. Replacement of external lighting with turtle friendly lighting is technically feasible, although is not considered to be practicable. | Given the potential impacts to turtles during this activity is insignificant, implementation of this control would not result in a reduction in consequence. | Grossly disproportionate. Implementation of the control requires considerable cost sacrifice and provides minimal environmental benefit. | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | CS: Significant cost sacrifice. The retrofitting of external lighting on the MODU and vessels, etc., would result in considerable cost and time expenditure. Considerable logistical effort to source sufficient inventory of the range of light types onboard the MODU. | | The costs/sacrifices outweigh the benefit gained. | |
| Variation of the timing of the Petroleum Activities Program to avoid peak turtle internesting periods (December to January). | F: Not feasible due to total length of drilling campaign, planned batch drilling sequence and successive activities dependent upon completion timing of D&C campaign execution<br>CS: Significant cost and schedule impacts due to delays in securing vessels/MODU for specific timeframes. | Not considered – control not feasible. | Not considered, control not feasible. | No |
| Do not flare. | F: No.<br>Flaring is the only feasible way to manage the reservoir fluids and achieve well objectives.<br>CS: Not considered – control not feasible | Not considered – control not feasible. | No considered – control not feasible. | No |
| Well unloading acceptance criteria that define the well objectives will be established. | F: Yes<br>CS: Standard practice | Eliminates unnecessary flared volumes and corresponding emissions (light and GHG) | Benefits outweigh cost/sacrifice | Yes<br>**C 1.2** |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| No additional controls identified. | | | | |
| **ALARP Statement:**<br>On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the potential impacts from routine light emissions from the MODU and vessels to be ALARP. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.1.1.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the EP acceptability criteria (**Section 2.3.5**)**:**<br>• Overall impact significance levels for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to routine light emissions have been adopted.<br>• There are no changes to internal context specific to this risk from the OPP.<br>• Impacts from routine light emissions was raised during consultation (**Appendix F, Table 1**) and this feedback was considered in the finalisation of the EP. |
| ***Acceptability Statement:***<br>The impact assessment has determined that, given the adopted controls, routine light emissions from external lighting on the MODU and project vessels is unlikely to result in an impact significance level greater than slight. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential impacts and the NLPG were taken into consideration during the impact evaluation. The Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice (**Section 6.8**).<br>The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of light emissions to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 1**<br>Undertake the Petroleum Activities Program in a manner that will not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results.<br>**EPO 2**<br>Undertake the Petroleum Activities Program in a manner that will not have a substantial adverse effect on a population of seabirds or shorebirds, or the spatial distribution of the population.<br>**EPO 3**<br>Undertake the Petroleum Activities Program in a manner that will not seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.<br>**EPO 4**<br>Undertake the Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of marine reptiles or the spatial distribution of the population. | **C 1.1**<br>Lighting will be limited to the minimum required for navigational and safety requirements, with the exception of emergency events. | **EPS 1.1**<br>Lighting will be limited to that required for safe work/navigation. | **MC 1.1.1**<br>Inspection verifies no excessive light being used beyond that required for safe work/ navigation. |
| | **C 1.2**<br>Well unloading acceptance criteria that defines well objectives will be established. | **PS 1.2**<br>Flaring restricted to a duration necessary to achieve the well objectives | **MC 1.2.1**<br>Records demonstrate flaring was restricted to a duration necessary to achieve well objectives. |

## 6.7.2 Routine Atmospheric and Greenhouse Gas Emissions

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| Section 7.1.2: Routine Atmospheric and Greenhouse Gas Emissions | | |
| **Context** | | |
| **Relevant Activities**<br>Well Flowback – **Section 3.8.5**<br>Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1**<br>Contingency Activities – **Section 3.10** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2**<br>Protected Species – **Section 4.6** | **Stakeholder Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Internal combustion engines and incinerators on MODU and vessels | | | | ✓ | | | | A | F | - | - | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 5, 6 |
| Well flowback (flaring) inc. base oil | | | | ✓ | | | | | | | | | | |
| Contingent venting of gas during drilling (i.e. well kick) | | | | ✓ | | | | | | | | | | |

**Description of Source of Impact**

Atmospheric emissions assessed in this EP have been classified into two categories:

- Atmospheric pollutants (non-greenhouse gas emissions) are gases and particulates from an activity, or piece of machinery, which have a recognised adverse effect on human health and/or flora and fauna. The main emissions responsible for these effects include carbon monoxide (CO), oxides of nitrogen (NOx), sulphur dioxide (SO2), particulate matter less than 10 microns (PM10), non-methane volatile organic compounds (VOCs), BTEX (benzene, toluene, ethylbenzene and xylenes), which are specific VOCs of interest
- Greenhouse gas (GHG) emissions are those gasses within the atmosphere that absorb long-wave radiation, and thus trap heat reflected from the Earth's surface. The main gases responsible for this effect include carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$). Other greenhouse gases include perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF6).

Applying definitions from the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard, GHG emissions associated with the activity are considered indirect because they are not from sources that are owned or controlled by Woodside. Woodside has influence over GHG emissions from the MODU, vessels and helicopters via contractual arrangements and scope definition, however does not have the authority to implement operational policies.

**MODU, Vessel and Helicopter Operations**

Atmospheric emissions are generated by project vessels from internal combustion engines (including all equipment and generators) and incineration activities (including onboard incinerators for standard operations, excluding drilling waste).

Atmospheric emissions generated during these operations will include SOx, NOx, particulates and VOCs. SOx and particulate matter emissions are heavily influenced by the fuel used and its relative sulphur content, MGO usually having a lower sulphite content than marine diesel oil (MDO) or heavy fuel oil (HFO).

$NO_2$ emissions from routine MODU power generation for an offshore project were modelled previously by another operator (BP, 2013). $NO_2$ is the focus of the modelling, on account of the larger predicted emission volumes compared to the other atmospheric emissions, and the potential for $NO_2$ to impact on human health (as a proxy for environmental receptors). The model demonstrated that atmospheric emissions generated by MODU operations may increase ambient $NO_2$ concentrations by 1 µg/m³ (0.001 ppm) within 10 km of the source and 0.1 µg/m³ (0.0001 ppm) within 40 km of the source. This represents an increase of 2% over typical background concentrations within 40 km, with air quality remaining well below the WHO air quality guideline for $NO_2$ of 40 µg/m³ annual mean. As $NO_2$ is the main emission that poses a threat to receptor health, it is considered conservative to use the above studies to justify potential impacts to receptors. As such, studies into the attenuation of other gasses emitted are not evaluated.

Based on fuel consumption information from the DPS-1 MODU on previous Woodside drilling campaigns and the expected activity duration plus mobilisation, it is estimated that a Dynamically Positioned MODU will consume approximately 30,000 m³ of diesel fuel. Applying the appropriate diesel emission factor from the National Greenhouse and Energy Reporting Scheme (NGERS), it is estimated that this fuel combustion would generate approximately 80,000 $tCO_2e$ of greenhouse gas emissions over the course of the activity due to fuel consumption.

Alternatively, if a moored MODU is used for the campaign then less fuel is needed for station keeping. Based on fuel consumption for the Ocean Apex (moored MODU) on previous drilling campaigns, and an extended duration per well to allow for mooring activities, it is estimated that a moored MODU would generate approximately 30,000 $tCO_2e$ of greenhouse emissions over the activity due to fuel consumption.

Vessels will operate within the PAA, although emissions produced will be substantially less than that of the MODU. Using an estimated fuel use of 5 t/d for support vessels (Energy Institute 2000) and diesel emission factor from NGERS, approximately 30,000 $tCO_2e$ of greenhouse gas will be emitted by vessels over the course of the activity.

Using an estimated fuel use of 600 L/r (Energy Institute 2000), and applying aviation fuel emissions factor from NGER, approximately 5000 $tCO_2e$ will be generated by helicopters over the course of the activity.

**Well Flowback (Flaring) and Contingency Activities (venting)**

Well flowback may be undertaken following running and testing the upper completion and will result in flaring and/or venting of hydrocarbons. During well flowback, initial unloading of the well displaces the well fluids (i.e. suspension/completion brine). These unloaded completion fluids are treated and discharged overboard. Once the brines are unloaded, the gas stream is sent to flare via the production separator. If flow rate is not sufficient to sustain a flare for MODU operations, venting will occur. Depending on the process selected (flaring or venting), the emissions may vary from methane to carbon dioxide, NOx, etc.

The volumes of hydrocarbons flared during well flowback are typically no more than 50 Mscf per well. Up to 300 bbl of base oil may also be flared per well as part of flowback operations. Applying NGER emission factors for flaring during oil and gas exploration, the total estimated greenhouse emissions generated by flaring during flowback for 10 wells is approximately 35,000 tCO2e over the course of the activity.

The global warming potential of un-combusted methane, which is the greatest component of Scarborough reservoir gas, is significantly greater than that of burnt methane. Therefore, greenhouse gas emissions would be greater during contingency venting activity. However, as described above, venting will only occur in cases where flare rate is not sufficient to maintain a flame, which is not credible for flowback of an entire well. The estimate of 35,000 tCO2e generated by flowback flaring for ten wells includes an allowance for a period of venting, and for minor fugitive emissions which may be released from the well test package.

During drilling of the well, a kick may occur. A kick is an undesirable influx of formation fluid into the wellbore. The resultant effect would be a release of a small volume of greenhouse gases via the degasser to the atmosphere during well control operations, known as ‘venting’. Venting is required to ensure well integrity is maintained in the event of a kick thereby avoiding an emergency condition.

During the study undertaken by BP (2013), $NO_2$ emissions from flaring were modelled for clean-up flaring on MODUs at a rate of 250 MMscfd for up to two days. This model showed that short term concentrations of $NO_2$ from MODU flaring increased by up to about 60 µg/m³ (0.06 ppm) within 10 km of the source and increase of up to 20 µg/m³ (0.02 ppm) at about 40 km from the source. These levels are intermittent and temporary and do not result in exceedances above the WHO air quality guideline for $NO_2$ of 40 µg/m³ annual mean.

**Mud Degassing**

Methane emissions may be released during the period of intersection with the reservoir. Small amounts of gases such as methane may dissolve in drilling fluids and be released to the atmosphere as fluids are degassed and recirculated. These emissions have been estimated using American Petroleum Institute factors and are negligible over the activity.

**Summary of GHG emissions**

Based on the estimates provided above, the total greenhouse emissions over the course of the entire activity are estimated to be 150,000 $tCO_2e$. This is approximately 0.02% of the Scarborough project lifecycle GHG emissions as presented in the OPP, which were assessed as having a negligible impact significance level.

**Table 6-4: Summary of estimated total greenhouse gas emissions over the Petroleum Activity Program**

| | Estimated GHG Emissions ($tCO_2e$) |
|---|---|
| MODU diesel combustion (DP) | 80,000 |
| Support vessel diesel combustion | 30,000 |
| Helicopter fuel combustion | 5,000 |
| Well flowback (unloading) flaring/venting | 35,000 |
| **Total** | 150,000 |

## Detailed Impact Assessment

### *Assessment of Potential Impacts*

***Air Quality (atmospheric pollutants)***

Atmospheric emissions may result in a decline in local air quality, within the immediate vicinity of the emissions source. As described above, produced emissions throughout the project will include $SO_2$, NOx, ozone depleting substances, $CO_2$, particulates and VOCs. Emissions from engines, generators and deck equipment may be toxic, odoriferous or aesthetically unpleasing, and will result in a reduction in air quality.

Given the offshore location of the PAA, and the low volumes of atmospheric emission which will be generated, biodiversity, ecological integrity, social amenities and human health will not be impacted and any potential impact to air quality is slight.

***Marine Fauna***

Atmospheric emissions can cause direct impacts to fauna, if they are present in the immediate vicinity of significant releases. Birds, for example, have been shown to suffer respiratory distress and illness when subjected to extended duration exposure to air pollutants (Sanderfoot and Holloway, 2017). Given that fauna numbers will be low at the point of discharge, injury or mortality to fauna a result of atmospheric discharges is negligible.

***Aesthetic Value***

Atmospheric emissions have the potential to introduce odour and visual amenity issues which can result in changes to the aesthetic value of an area.

Given the distance from shore of the PAA (215 km), the potential for a change in air quality from atmospheric emissions resulting in a change to aesthetic value for tourism/recreation or settlements is not considered to be credible. As the PAA is not directly visible from the nearest landfall, the flare and potential smoke resulting from emissions will not impact visual amenity, and no impacts to visual amenity for settlements are expected. Therefore, a change in aesthetic value from atmospheric emissions associated with Petroleum Activities Program is negligible.

***GHG Emissions***

GHG emissions attributed to the MODU, vessels and helicopters contribute to global concentrations of GHG emissions. Cumulative increases in net global atmospheric GHG concentrations are considered to contribute to climate change. It is important to acknowledge that climate change impacts cannot be directly attributed to any one activity, as they are instead the result of global GHG, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution.

The impact assessment of the potential impacts of climate change on sensitive receptors, within Australian jurisdictions is described in Section 7.1.3.8 of the Scarborough OPP (SA0006AF0000002, rev 5). More recent climate change reports have been published with updated projections of climate change, including the IPCC's Sixth Assessment Report (AR6) and the CSIRO and Bureau of Meteorology's State of the Climate 2020, which outlines the projected changes to Australia's climate. AR6 projects a slight increase in warming for similar emissions scenarios to AR5 (as presented in the Scarborough OPP), with a narrower range of uncertainty of these projections (higher confidence rates). The slight increase in warming is a result of a range of factors including the higher estimate of historical warming in AR6 and updated estimates of climate sensitivity (IPCC, 2020). The impact or risk evaluation described in Section 7.1.3.8 of the OPP does not change.

| ***Summary of Assessment Outcomes*** | | | | |
|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity Level** | **Magnitude** | **Impact Significance Level** |
| Air quality | Change in air quality | Low value (open water) | Slight | Negligible (F) |
| ***Overall Impact Significance Level:*** The overall impact significance level for routine atmospheric and GHG emissions is F based on a slight effect to air quality of the regional airshed and a low value receptor. The impact significance levels for individual receptors are consistent with the level in the OPP. | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Marine Order 97 (Marine pollution prevention – Air pollution). | F: Yes.<br>CS: Minimal cost. Standard practice | Legislative requirements to be followed may slightly reduce the likelihood of air pollution. | Control based on legislative requirements – must be adopted. | Yes<br>**C 2.1** |
| Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: Accepted Well Operations Management Plan (WOMP) and application to drill. | F: Yes.<br>CS: Minimal cost. Standard practice. | The accepted WOMP will manage the risk of well kicks, reducing the likelihood of occurrence. No reduction in consequence will occur. | Control based on legislative requirements – must be adopted | Yes<br>**C 2.2** |
| As-built checks that shall be completed during well operations to establish a minimum acceptable standard of well integrity is achieved. | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduces the likelihood of occurrence. No reduction in consequence will occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 2.3** |
| Burning and flaring during well unloading activities will be conducted using Woodside and Vendor approved TPS (Temporary Production System) Package. | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduces the likelihood of atmospheric emissions impacting air quality. Consequence remains unchanged. | Benefits outweigh cost/sacrifice. | Yes<br>**C 2.4** |
| Oil burner will operate efficiently to maximise combustion. | F: Yes.<br>CS: Minimal cost. Standard practice. | This control results in a reduction on likelihood of atmospheric emissions impacting air quality, consequence remains unchanged. | Benefits outweigh cost/sacrifice. | Yes<br>**C 2.5** |
| Subsea BOP installed and tested during drilling operations. | F: Yes.<br>CS: Standard practice. Required by Woodside standards. | BOP testing reduces the volume of gas vented in the event of a well kick. | Benefits outweigh cost/sacrifice. | Yes<br>**C 2.6** |
| Process conducted to calculate, update and monitor kick tolerance for | F: Yes. | Processes will reduce the volume of gas | Benefits outweigh cost/sacrifice. | Yes<br>**C 2.7** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| use in well design and while drilling. | CS: Minimal cost. Standard practice for Woodside activities. | vented in the event of a well kick. | | |
| Well control bridging document for alignment of Woodside and the MODU Contractor in order to manage the equipment and procedures for preventing and handling a well kick. | F: Yes.<br>CS: Minimal cost. Standard practice for Woodside activities. | Implementing equipment and procedures in the well control bridging document will reduce the volume of gas vented in the event of a well kick. | Benefits outweigh cost/sacrifice. | Yes<br>**C 2.8** |
| Reporting of GHG emissions as required by regulatory requirements | F: Yes.<br>CS: Minimal cost. Standard practice for Woodside activities. | Tracking and reporting of emissions gives visibility to performance and enables improvement opportunities to be identified. Reporting increases transparency and accountability which can also drive performance improvements. | Control based on legislative requirements – must be adopted | Yes<br>**C 2.9** |
| ***Professional Judgement – Eliminate*** | | | | |
| Do not combust fuel. | F: No. There are no MODUs or vessels that do not use internal combustion engines.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| Do not vent during well kick. | F: No. Venting is a critical safety activity required in the event of a kick to reduce pressure build up.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| Well unloading acceptance criteria that define the well objectives will be established. | F: Yes<br>CS: Standard practice | Eliminates unnecessary flared volumes and corresponding emissions (light and GHG) | Benefits outweigh cost/sacrifice | Yes<br>**C 1.2** |
| Assess opportunities to eliminate well flowback flaring to MODU.<br>The assessment will consider factors such as:<br>• HSE considerations<br>• Well performance | F: To be decided on per well basis. The decision on whether to unload to the MODU or FPU will be based on technical study outcomes.<br>CS: Cost effective but introduces additional | Minimises environmental impact through the reduction of GHG emissions Well flowback may be avoided entirely for some or all wells. In this case the wells are instead flowed | Benefits potentially outweigh cost/sacrifice | Yes<br>**C 2.10** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| • Proof of completions success<br>• Solids and liquids handling<br>• Potential eventual other impacts to the topsides. | risks to the production facility (i.e. risk of equipment and subsea system failures due to solids) | back to the eventual host facility (the Scarborough Floating Production Unit), resulting in a small increase to expected bean-up flaring for each well but resulting in a net overall flaring decrease of up to 2000 $tCO_2e$ per well.<br>The decision on whether to unload to the FPU will be based on the outcome of ongoing studies and operational data gathered during the drilling activity. | | |
| Reduce and optimise well count. | F: Yes<br>CS: Cost effective | The operating mode for Scarborough includes less "redundancy" than usual. In addition well count has been reduced via well design, large bore and high operational flowrates. As the GHG emissions of the overall activity is highly sensitive to well count, a reduced well count minimises environmental impacts. | Cost effective. Number of wells drilled has been minimised to fewest possible to achieve operating philosophy. | Yes<br>Has been applied in design phase |
| ***Professional Judgement - Substitute*** | | | | |
| Preferentially utilise moored MODU rather than Dynamically Positioned | F: Yes<br>CS: Costs and schedule implications of selecting moored MODU, rather than selecting a DP MODU due to anchor setting / handling requirements moving between wells (particularly during batch drilling). | If a moored MODU is used for the campaign then less fuel is needed for station keeping. Reducing fuel combustion reduces atmospheric emissions. | Sacrifice outweighs benefit – schedule, H&S and cost implications of using a Moored MODU are grossly disproportionate to potential environmental gains.<br>The use of a moored MODU requires significant anchor handling to move between wells, impeding ability to implement a batch drilling | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | | | schedule, materially increasing activity duration and associated exposure to H&S risks and impacts. DP MODUs also offer superior cyclone avoidance. Use of a moored MODU expected to add ~$50M to campaign costs. | |
| Capture and combust gas released from mud during reservoir intersection, rather than venting | F: Yes<br>CS: Cost of additional equipment | Negligible reduction in GHG emissions | Sacrifice outweighs benefit. GHG emissions from methane dissolved in mud (degassing) have been estimated and are negligible. Addition of combustion system instead of safe vent location introduces process safety risk, and requires significant engineering such as control and safety system, ignition and flame maintenance infrastructure. | No |
| ***Professional Judgement – Engineered Solution*** | | | | |
| Manage vessel speed to reduce fuel combustion | F: Yes<br>CS: Standard practice | Reducing fuel combustion reduces atmospheric emissions. | Benefits outweigh cost/sacrifice | Yes<br>**C 2.11** |
| Contracting strategy and evaluation for hire of support vessels includes consideration of vessel emissions parameters and low carbon / alternative fuels | F: Yes<br>CS: Fuel cost over the contract is considered in evaluation of responses, allowing for competitive consideration of low carbon alternatives | Minimises cost and emissions through efficiency recognising cost of fuel and carbon emissions over the contract term | Control effectively allocates a cost to emissions to recognise that higher emitting fuel sources with other lower operating costs do not represent overall best value. | Yes<br>**C 2.12** |
| Use more fuel efficient DP MODU | F: N<br>CS: Significant additional cost to source alternative MODU or vessels not already in region | Minor/uncertain reduction in GHG emissions. | Analysis of fuel efficiency of DP MODUs for which Woodside has data indicates only minor variation among candidates. | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | | | Preferred MODU DPS-1 is considered to have better than average speed of well completion, shortening duration of activity and associated emissions. Additionally, DPS-1 will be travelling from a recent activity on North West Shelf, whereas transport emissions associated with bringing an alternative DP to location would erode any potential fuel efficiency benefits. | |
| Contractors will be engaged to identify additional GHG emissions reduction opportunities | F: Yes<br>CS: Minimal – Good Practise | Woodside does not have operational control over drilling operations, however through sharing aspirations and collaborating new opportunities may be identified and implemented to further reduce emissions | Benefits outweigh cost/sacrifice | Yes<br>**C 2.13** |
| Track and review emissions during the Petroleum Activities Program with the objective to identify further opportunities to improve efficiencies | F: Yes<br>CS: Minimal | Tracking and reviewing allows interrogation of GHG emissions associated with the Petroleum Activities Program, particularly on a per-well basis. This may enable the identification further opportunities to reduce GHG emissions. | Benefits outweigh cost/sacrifice | Yes<br>**C 2.14** |
| **ALARP Statement:**<br>On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls good oil-field practice, and appropriate to manage the impacts of fuel combustion, flaring, incineration and venting. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of the aspect and associated impacts assessed in this section are provided in Section 7.1.3.9 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall impact significance levels for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to GHG emissions have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP however additional information related to climate change and energy emission outlooks has become available since the Scarborough OPP was accepted (February 2020). These have included:<br>– Woodside setting clear targets, to reduce net equity scope 1 and 2 emissions below the gross 2016-2020 annual average by 15% in 2025 and 30% in 2030 on a pathway to our aspiration of net zero by 205030. These targets apply to emissions from the Scarborough Project.<br>– Woodside will apply offsets (carbon credits) where necessary to meet its obligations under these corporate targets.<br>– Australia's emissions projections demonstrate that it is on track to reduce emissions by up to 35% below 2005 levels by 2030 (UNFCCC, Australia's NDC 2021), in line with its NDC targets to reduce emissions by 26–28% below 2005 levels by 2030, under the Paris Agreement.<br>– Australia has updated its Nationally Determined Contribution (NDC) under the Paris Agreement, to a reduction in greenhouse gas emissions by 43% below 2005 levels by 2030, on a path leading to net zero by 2050<br>– The International Energy Agency (IEA) updated in its World Energy Outlook 2021. In the most ambitious scenario ("NZE"), which achieves net zero emissions by 2050 and limits the global rise in temperature to 1.5 °C, the IEA projects further investment in oil and gas supply is needed every year to 2030, above the actual 2020 level, and with yet more investment required in other scenarios. (Figure 6.18 and Table 6.1 of World Energy Outlook 2021). In the Paris-aligned Sustainable Development Scenario, natural gas consumption in Asia is projected to grow by over 36% between 2020 and 2030 and remains above 2020 levels through 2050 (Table A.12 of World Energy Outlook 2021). Noting that the NZE scenario aligns with Woodsides aspiration to reach net zero by 2050.<br>– The GHG emissions that will be generated by the petroleum activity described in this environment plan are limited in magnitude and duration, and the activity will be completed prior Australia's first target milestone and are therefore consistent with Australia's targets.<br>• Climate change was raised during consultation however feedback on climate change related more broadly to indirect emissions from gas production during Operations, which is not within the scope of this EP (See **Table 5-3** and **Section 6.5**). Feedback on GHG emission generated by the petroleum activities program was considered in the finalisation of the EP. |
| ***Acceptability Statement:***<br>The impact assessment has determined that, given the adopted controls, routine atmospheric emissions from fuel combustion, flaring, incineration, and venting are unlikely to result in an impact significance greater than negligible. The adopted controls are considered consistent with industry legislation, codes and standards, and professional judgement and meet the requirements of Australian Marine Orders.<br>The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of atmospheric emissions to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 5**<br>Undertake the Petroleum Activities | **C 2.1**<br>Marine Order 97 (Marine Pollution Prevention – Air | **PS 2.1**<br>MODU and project vessels compliant with Marine Order | **MC 2.1.1**<br>Marine Assurance inspection records |

[30] For Woodside's equity share of emissions from the facility (e.g. fuel use, flaring, production of natural occurring $CO_2$ from our petroleum reservoirs) and emissions associated with the generation of any power that we purchase.

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| Program in a manner that will not result in a substantial change in air quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health.<br><br>**EPO 6**<br>Assess opportunities to improve energy efficiency and reduce GHG emissions from the Petroleum Activities Program. | Pollution) which detail requirements for:<br>• International Air Pollution Prevention (IAPP) Certificate, required by vessel class<br>• use of low sulphur fuel when available<br>• Ship Energy Efficiency Management Plan (SEEMP), where required by vessel class<br>• onboard incinerator complies with Marine Order 97. | 97 (Marine Pollution Prevention – Air Pollution) to restrict emissions to those necessary to perform the activity.<br>Vessel marine assurance process conducted prior to contracting vessels, to ensure suitability and compliance with vessel combustion certification/marine order requirements. | demonstrate compliance with Marine Order 97. |
| | **C 2.2**<br>Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: accepted Well Operations Management Plan (WOMP), which describes the well design and barriers to be used to prevent a loss of well integrity, specifically:<br>• all permeable zones penetrated by the well bore, containing hydrocarbons or over-pressured water, shall be isolated from the surface environment by a minimum of two barriers (primary and secondary) (a single fluid barrier may be implemented during the initial stages of well construction if appropriateness is confirmed by a shallow hazard study)<br>• discrete hydrocarbon zones shall be isolated from each other (to prevent cross flow) by a minimum of one barrier where deemed required<br>• all normally pressured permeable water-bearing formations shall be isolated from the surface by a minimum of one barrier.<br>The barriers shall: | **PS 2.2.1**<br>Wells drilled in compliance with the accepted WOMP, including implementation of barriers to prevent a loss of well integrity. | **MC 2.2.1**<br>Acceptance letter from NOPSEMA demonstrates the WOMP and application to drill were accepted by NOPSEMA prior to the drilling activity commencing.<br><br>**MC 2.2.2**<br>Records demonstrate minimum of two verified barriers (a single fluid barrier may be implemented during the initial stages of well construction if appropriateness is confirmed by a shallow hazard study) were in place for all permeable zones penetrated by the wellbore.<br><br>**MC 2.2.3**<br>Records demonstrate composition and weight of drilling fluids were applicable to down hole conditions. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | • be effective over the lifetime of well construction<br>• (fluid barriers) remain monitored and provide sufficient pressure to counter pore pressure during well construction<br>• (cementing barriers, including conductor, casing and liners) conform to the relevant minimum standards set out in the Woodside Engineering Standard – Well Cementation.<br>Verification:<br>effectiveness of primary and secondary barriers shall be verified (physical evidence of the correct placement and performance) during the drilling of the well. | | |
| | **C 2.3**<br>As-built checks shall be completed during well operations. | **PS 2.3.1**<br>Achieve a minimum acceptable standard of well integrity. | **MC 2.3.1**<br>Records show Well Acceptance criteria are developed for each well. |
| | | | **MC 2.3.2**<br>Records demonstrate Well Acceptance Criteria have been met. |
| | **C 2.4**<br>Burning and flaring during well unloading activities will be conducted using Woodside and Vendor approved TPS Package. | **PS 2.4.1**<br>Maintain gas flare, air supply and oil burner to maximise efficiency of combustion and minimise venting. | **MC 2.4.1**<br>Records demonstrate that a Woodside approved TPS package is in use during well unloading/ testing. |
| | **C 2.5**<br>Oil burner will operate efficiently to maximise combustion. | **PS 2.5.1**<br>Oil burner will have combustion efficiency greater than 99%. | **MC 2.5.1**<br>Records demonstrate that oil burner is greater than 99% efficient. |
| | **C 2.6**<br>Subsea BOP installed and tested during drilling operations. The BOP shall include:<br>• one annular preventer<br>• two pipe rams (excluding the test rams)<br>• a minimum of two sets of shear rams, one of which must be capable of sealing | **PS 2.6.1**<br>Subsea BOP specification, installation and testing compliant with internal Woodside Standards and international requirements (API Standard 53 5th Edition) as agreed by Woodside and MODU contractor. | **MC 2.6.1**<br>Records demonstrate that BOP and BOP control system specifications and testing were in accordance with minimum standards for the expected drilling conditions as agreed by Woodside and MODU contractor. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | • deadman functionality<br>• the capability of ROV intervention<br>• independent power systems. | | |
| | **C 2.7**<br>Process conducted to calculate, update and monitor kick tolerance for use in well design and while drilling, including:<br>• The BOP shall be closed upon detecting a positive well influx.<br>• The shut in procedure shall be according the rig contractor procedures or as the well conditions dictate.<br>• Kick tolerance calculations will be made for drilling all hole sections based on the weakest known point in the well. Kick detection techniques will be adjusted based on the level of kick tolerance through a management of change (MOC).<br>• The manual also includes requirements for kick tolerance management in the event of down-hole losses. | **PS 2.7.1**<br>Kick tolerance is calculated, managed, monitored and updated while drilling. | **MC 2.7.1**<br>Records demonstrates well kick tolerance is calculated, managed, monitored and updated while drilling. |
| | | | **MC 2.7.2**<br>Records demonstrate shut-in procedures followed in the event of a potential well kick. |
| | **C 2.8**<br>Well control bridging document for alignment of Woodside and the MODU Contractor in order to manage the equipment and procedures for preventing and handling a well kick. | **PS 2.8.1**<br>Well is drilled in accordance with the contractor WCBD to reduce the likelihood of emissions to air from a well kick during drilling operations. | **MC 2.8.1**<br>Records demonstrate well drilled in accordance with WCBD. |
| | **C 2.9**<br>Reporting of GHG emissions as required by regulatory requirements | **PS 2.9.1**<br>GHG emission regulatory reporting undertaken as required | **MC 2.9.1**<br>Records demonstrate required regulatory GHG emission reported |
| | **C 2.10**<br>Assess opportunity to eliminate well flowback flaring to MODU.<br>The assessment will consider factors such as: | **PS 2.10.1**<br>Study assessing unloading to MODU vs. FPU undertaken. | **MC 2.10.1**<br>Records demonstrate study on unloading to MODU vs FPU undertaken. |
| | | **PS 2.10.2** | **MC 2.10.2** |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | • HSE considerations<br>• Well performance<br>• Proof of completions success<br>• Solids and liquids handling<br>• Potential eventual other impacts to the topsides | No well unloading to the MODU, where considered technically feasible and ALARP | Records demonstrate no well unloading to the MODU, where considered feasible and ALARP. |
| | **C 2.11**<br>Manage vessel speed to reduce fuel combustion | **PS 2.11.1**<br>Vessel speed will be managed to reduce fuel consumption where practicable. | **MC 2.11.1**<br>Records demonstrate speed of support vessels managed |
| | **C12.12**<br>Contracting strategy and evaluation for hire of support vessels includes consideration of vessel emissions parameters and low carbon / alternative fuels | **PS 2.15**<br>Evaluation of tenders of support vessels considers emissions parameters and low carbon / alternative fuels. | **MC 2.15.1**<br>Records demonstrate that emission were considered in tender evaluations |
| | **C 2.13**<br>Contractors will be engaged to identify additional GHG emissions efficiencies | **PS 2.12.1**<br>Contractors engaged prior to mobilisation on energy/ GHG emissions efficiencies. | **MC 2.12.1:**<br>Minutes of meetings with contractor including any identified opportunities. |
| | | **PS 2.12.2**<br>Opportunities identified implemented, where technically feasible and ALARP. | **MC 2.12.2**<br>Records demonstrate that opportunities, if identified, to reduce GHG emissions have been implemented during the Petroleum Activities Program. |
| | **C 2.14**<br>Track and review emissions to identify further opportunities to improve efficiencies. | **PS: 2.13.1**<br>Emissions tracked in D&C Well Construction $CO_2$ Dashboard | **MC 2.13.1**<br>Emissions for each well are included in the Dashboard |
| | | **PS 2.13.2**<br>GHG Emission performance reviewed periodically during the campaign (when data is available) for optimisation opportunities. | **MC 2.13.2**<br>Records of review indicates that GHG emission performance was considered and opportunities for improvement documented/communicated if appropriate. |
| | **C 1.2**<br>Refer to **Section 6.7.1** | **PS 1.2.1**<br>Refer to **Section 6.7.1** | **MC 1.2.1**<br>Refer to **Section 6.7.1** |

## 6.7.3 Routine Acoustic Emissions – Generation of Noise from MODU, Project Vessels and Positioning Equipment

**Scarborough OPP – Relevant Impact Assessment Section**

Section 7.1.4 (Routine Acoustic Emissions)

**Context**

| Relevant Activities | Existing Environment | Consultation |
|---|---|---|
| Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1**<br>Contingency Activities – **Section 3.10** | Marine Regional Characteristics – **Section 4.2**<br>Marine Fauna of Conservation Significance – **Section 4.6** | Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| *Source of Impact/Risk* | *Environmental Value Potentially Impacted* | | | | | | | *Evaluation* | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Soil and Groundwater | Marine Sediment | Water Quality | Air Quality (inc. odour) | Ecosystems / Habitat | Species | Socio-economic | Decision Type | Impact/Consequence | Likelihood | Current Risk Rating | ALARP Tools | Acceptability | Outcome |
| Generation of acoustic signals from MODU, drilling and support vessels during normal operations | | | | | | ✓ | | A | E | - | - | PJ | Broadly Acceptable | EPO 3, 4, 8 |
| Generation of acoustic signals from DP systems on MODU and support vessels | | | | | | ✓ | | | | | | | | |
| Generation of acoustic signals from positioning equipment (transponders) | | | | | | ✓ | | | | | | | | |

**Description of Source of Impact/Risk**

The MODU and project vessels will generate noise both in the air and underwater, due to the operation of thrusters, engines, propeller cavitation, drilling operations etc. Vessels, including the MODU, may use Dynamic Positioning (DP) where propellers and thrusters are used to hold position, rather than anchoring. These noises will contribute to and have the potential to exceed ambient noise levels which range from around 90 dB re 1 µPa (root square mean sound pressure level [rms SPL]) under very calm, low wind conditions, to 120 dB re 1µPa (rms SPL) under windy conditions (McCauley, 2005).

***MODU Operations (Excluding DP)***

During drilling operations, the MODU will produce low-intensity continuous sound. Sound produced from an active MODU is predominantly below 2 kHz, with peak frequencies below 500 Hz. Measured frequencies for the West Aquarius MODU, which is expected to be similar to the MODU that will be contracted for the Scarborough drilling activity, recorded a peak frequency at 190 Hz (Martin et al.,2019). A range of broadband values, 59–185 dB re 1 µPa at 1 m (SPL), have been quoted for various MODUs (Simmonds et al., 2004). McCauley (1998) recorded source noise levels for moored MODUs from 149–154 dB re 1 µPa at 1 m while actively drilling (with support vessel on anchor) and Greene (1987) recorded source levels of two moored drillships from 145–158 dB re 1 µPa at 1 m during drilling (with support vessels idling nearby). An acoustic monitoring program commissioned by Santos was conducted during an exploratory drilling

program in 2003, which indicated that the drilling operation was not audible from between 8 and 28 km from the MODU (or beyond) (McCauley, 2005).

***Project Vessels and Operation of DP***

Vessels produce low frequency sound (i.e. below 1 kHz) from the operation of machinery, hydrodynamic flow sound around the hull and from propeller cavitation, which is typically the dominant source of sound (Ross, 1987, 1993). Vessels in the 50–100 m size class (e.g. supply ships, crew boats, research vessels) produce broadband source levels in the 165–180 dB re 1 µPa SPL range (Gotz et al., 2009). In comparison, underwater sound levels generated by large ships can produce levels exceeding 190 dB re 1 µPa (Gotz et al., 2009), and small vessels up to the 20 m size class typically produce sound at source levels of 151–156 dB re 1µPa (Richardson et al., 1995).

McCauley (1998) measured underwater broadband noise equivalent to about 182 dB re 1 µPa at 1 m (RMS SPL) from a support vessel holding station in the Timor Sea; it is expected that similar noise levels will be generated by support vessels used for this Petroleum Activities Program.

DP MODU underwater noise measurements were taken for the West Aquarius MODU by JASCO on the Scotian Shelf in Canada, which is expected to have a similar thruster configuration to the MODU that will be contracted for the Scarborough drilling activity. The 90th percentile of the broadband radiated sound levels was 186.3 dB re 1 µPa (Martin et al., 2019). This is similar to measurements taken for the Maersk Discoverer drill rig on the North West Shelf (Woodside, 2011), where the system emitted tonal signals between 200 Hz to 1.2 kHz, at a source level between 176 and 185 dB re 1 µPa SPL @ 1 m.

Project vessels and the MODU are conservatively expected to have an overall combined source level of 192 dB re 1 µPa (rms SPL), which represents a doubling of sound pressure from the single loudest source (i.e. 186 dB + 6 dB). Cumulative noise from the MODU and/or multiple project vessels operating in the PAA may result in elevated noise levels, and will be assessed in subsequent EPs (i.e. for activities such as trunkline installation and the SURF scope).

***Generation of Underwater Noise from Positioning Equipment***

An array of long baseline (LBL) and/or ultra-short baseline (USBL) transponders may be installed on the seabed for metrology and positioning. An array of transponders is proposed within a radius of 500 m from the proposed location of the wells and will be in place for a period of about three months per well.

Transponders typically emit pulses (impulsive noise) of medium frequency sound, generally within the range 21 to 31 kHz. The estimated SPL would be 180–206 dB re 1 µPa at 1 m (Jiménez-Arranz et al., 2017). LBL will be used for rig activities, however the xmas tree deployment vessel will use USBL. Transmissions are not continuous but consist of short 'chirps' with a duration that ranges from 3–40 milliseconds. Transponders will not emit any sound when on standby and are planned to only actively emit sound for about six hours per well. When required for general positioning they will emit one chirp every five seconds (estimated to be required for four hours at a time). When required for precise positioning they will emit one chirp every second (estimated to be required for two hours at a time). For moored drilling transponders are expected to be only active at the commencement of the drilling where positioning is required. For DP MODU positioning an array of transponders will be active whilst the drill rig is on location.

***Contingency Activities (Additional Development Well, Respud, Sidetrack)***

Contingency activities which involve drilling, such as an additional development well, respud and sidetrack, will involve the use of a MODU and vessels, plus drilling operations. Any acoustic emissions generated will be the same as those expected from the planned activities described above.

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

***Receptors***

The PAA is located in water depths of approximately 900–955 m (refer to **Section 3.4**). The fauna associated with this area will be predominantly pelagic species of fish, with migratory species such as cetaceans and marine turtles potentially occurring in the area seasonally (**Section 4.6**). Noise interference is a key threat to a number of migratory and threatened cetaceans and marine turtles identified as potentially occurring within the PAA, including the pygmy blue whale. Relevant actions included in recovery plans for these species are outlined in **Section 6.9.**

A pygmy blue whale migration BIA is located about 35 km east of the PAA (**Section 4.6.3**). Individual pygmy blue whales may occasionally transit the PAA during April to July and October to January during their seasonal migrations. A humpback whale migration BIA is located about 155 km south-east of the PAA, and migrating whales may be present between about May and November. Occasional individuals may transit through the PAA.

The nearest marine turtle internesting buffer BIA for the flatback turtle is located about 165 km east of the PAA at the Montebello Islands. Given the water depths and distance from shore, the PAA does not represent suitable foraging or internesting habitat and therefore, marine turtle presence within the PAA is expected to be infrequent.

<u>Potential Impact of Noise</u>

Elevated underwater noise can affect marine fauna, including cetaceans, marine turtles, fish, sharks and rays, in three main ways (Richardson et al., 1995; Simmonds et al., 2004):

- by causing direct physical effects on hearing or other organs. Hearing loss may be temporary (temporary threshold shift [TTS]; referred to as auditory fatigue), or permanent threshold shift (PTS; injury);
- by masking or interfering with other biologically important sounds (including vocal communication, echolocation, signals and sounds produced by predators or prey); and
- through disturbance leading to behavioural changes or displacement from important areas (e.g. BIAs). The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation.

Sound Propagation

Increasing the distance from the noise source results in the level of noise reducing, due primarily to the spreading of the sound energy with distance. The way that the noise spreads (geometrical divergence) will depend upon several factors such as water column depth, pressure, temperature gradients, and salinity, as well as surface and bottom conditions.

***Cetaceans***

*Species Sensitivity and Thresholds*

Marine mammals and especially cetaceans rely on sound for important life functions including individual recognition, socialising, detecting predators and prey, navigation and reproduction (Weilgart, 2007; Erbe et al., 2015; Erbe et al., 2018). Underwater noise can affect marine mammals in various ways including interfering with communication (masking), behavioural changes, a shift in the hearing threshold (PTS and TTS), physical damage and stress (Erbe, 2012; Rolland et al., 2012).

The thresholds that could result in a behavioural response, temporary threshold shift (TTS) and permanent threshold shift (PTS) for cetaceans as a result of continuous noise sources are presented in **Table 6-5**. These thresholds have been adopted by the United States National Oceanic and Atmospheric Administration (NOAA) (National Marine Fisheries Service [NMFS], 2014, 2018; Southall et al., 2019; NOAA, 2019).

**Table 6-5: Thresholds for PTS, TTS and behavioural response onset for low-frequency (LF) and high-frequency (HF) cetaceans for continuous noise**

| Hearing group and generalised hearing range | PTS onset thresholds: $SEL_{24h}$ (dB re 1 µPa².s) | TTS onset thresholds: $SEL_{24h}$ (dB re 1 µPa².s) | Behavioural response (dB re 1 µPa) |
|---|---|---|---|
| LF cetaceans | 199 | 179 | 120 |
| HF cetaceans | 198 | 178 | 120 |

*Source: NMFS (2014, 2018; Southall, 2019; NOAA, 2019).*

*Impact Assessment*

JASCO modelled underwater noise levels during the proposed construction and operation of the Scarborough Development, including noise from a support vessel (the Setouchi Surveyor), which operates on 4600 HP while producing a broadband source level of 186.1 dB re 1 re 1 $\mu Pa^2m^2$ (McPherson et al. 2019). Maximum-over-depth horizontal distances to PTS thresholds for LF cetaceans as a result of the modelled support vessel was about 10 m from the source. TTS thresholds could be reached at up to 230 m from the source for the support vessel. PTS and TTS thresholds would therefore not be exceeded in the pygmy blue whale BIA. The predicted distances for PTS and TTS criteria exceedance are based upon exposure for 24-hours by a stationary receptor, which is not a realistic scenario. PTS and TTS thresholds are therefore not expected to be exceeded for cetaceans transiting through the PAA.

As described above, the MODU is expected to have a similar thruster configuration to the West Aquarius, which has been measured to have a source level of 186.3 dB 1 µPa. Based on an intermediate spreading equation to estimate sound propagation loss (15Log(R)), which is considered conservative for the water depths of the PAA), noise levels would drop below 120 dB re 1 µPa (behavioural response threshold; refer **Table 6-5**) within about 26 km. Modelling of propagation loss for the West Aquarius, conducted by JASCO in a water depth of 1137 m off the coast of Canada, predicted that noise levels would drop below 120 dB re 1 µPa within about 47 km (Matthews et al., 2017). While the sound speed profile of the water column and bathymetry may be different, the modelling provides a broad comparison to support that the estimated propagation loss is within the right order of magnitude. The modelling also predicted that underwater noise from the West Aquarius would drop below PTS thresholds within 230 m and a similar distance may be expected for the Petroleum Activities Program.

For an operating MODU with support vessel on standby with a combined source level of about 192 dB re 1 µPa (rms SPL), noise levels would drop below 120 dB re 1 µPa within about 64 km using the same intermediate spreading equation.

Given the sound propagation loss estimated above for an operating MODU and project vessels, there is no potential for injury (PTS or TTS) to pygmy blue whales migrating within the BIA (about 35 km from the PAA). Injury to other cetacean species is also not considered credible as individuals are not expected to spend long durations in close proximity to operations and are more likely to be transiting through the area.

It is reasonable to expect that cetaceans may demonstrate avoidance or attraction behaviour to the noise generated by the Petroleum Activities Program. For example, when transiting through the area, pygmy blue whales may deviate slightly from their migration route, but continue on their migration pathway. Considering proximity of the pygmy blue whale migration BIA to the PAA (about 35 km), it is likely that individuals may transit in and around the PAA during migratory periods; however, only transient individuals or small groups are expected. Further, the PAA is surrounded by open water, with no restrictions (e.g. shallow waters, embayments) to an animal's ability to avoid the activities.

Transponders used for positioning have the potential to cause some temporary behavioural disturbance to marine fauna; however, noise levels will be well below injury thresholds. Based on empirical spreading loss estimates measured by Warner and McCrodan (2011), received levels from USBL transponders are expected to exceed the cetacean behavioural response threshold for impulsive sources out to about 42 m. Given the short-duration chirps and the mid frequencies used by positioning equipment, the acoustic noise from a single transponder is unlikely to have any substantial effect on the behavioural patterns of marine fauna. Therefore, potential impacts from transponder noise are likely to be restricted to temporary and localised avoidance behaviour of individuals transiting through the PAA, and therefore are considered localised with no lasting effect.

Potential impacts from predicted noise levels from project vessels (including MODU and support vessels) and transponders are not considered to be ecologically significant at a population level.

***Marine Turtles***

*Species Sensitivity and Thresholds*

There is a paucity of data regarding responses of marine turtles to underwater noise. However, turtles have been shown to respond to low frequency sound, with indications that they have the highest hearing sensitivity in the frequency range 100–700 Hz (Bartol and Musick, 2003). Lenhardt (1994) observed marine turtles avoiding low-frequency sound.

A Popper et al. (2014) review assessed thresholds for marine turtles and found qualitative results that TTS was only moderate for near field exposure, and low for both intermediate and far field exposure (Popper et al., 2014). McCauley et al. (2000) noted that sea turtles exhibit increased swimming activity at 166 dB re 1 µPa. No numerical thresholds have been developed for impacts of continuous sources (e.g. vessel noise) on marine turtles.

The thresholds listed in **Table 6-6** are considered appropriate for the assessment of impacts from continuous acoustic discharges to marine turtles from the Petroleum Activities Program.

**Table 6-6: Impact thresholds to marine turtles for continuous noise**

| Receptor | Mortality and potential mortal injury | PTS | TTS | Masking | Behaviour |
|---|---|---|---|---|---|
| Marine turtles | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | (N) High<br>(I) High<br>(F) Moderate | (N) High<br>(I) Moderate<br>(F) Low |

*Note: The sound units provided in the table above include: relative risk (high, medium and low) is given for marine turtles at three distances from the source defined in relative terms as near (N – tens of metres), intermediate (I – hundreds of metres) and far (F – thousands of metres) (after Popper et al. 2014).*

*Impact Assessment*

The Recovery Plan for Marine Turtles (Commonwealth of Australia, 2017) notes there is limited information available on the impact of noise on marine turtles and that the impact of noise on turtle stocks may vary depending on whether exposure is short (acute) or long-term (chronic). However, given the thresholds outlined in **Table 6-6**, it is reasonable to expect that marine turtles may demonstrate avoidance or attraction behaviour to the noise generated by the Petroleum Activities Program.

There are no marine turtle BIAs or Habitat critical within 165 km of the PAA, and given the water depths and distance from shore, the PAA does not represent suitable foraging or internesting habitat. Marine turtle presence is expected to be infrequent, and potential impacts from predicted noise levels from the project vessels (including MODU and support vessels) are not considered to be ecologically significant at a population level.

***Fish, Sharks and Rays***

*Species Sensitivity and Thresholds*

Fish perceive sound through the ears and the lateral line, which are sensitive to vibration. Some species of teleost or bony fish (e.g. herring) have a structure linking the gas-filled swim bladder and ear, and these species usually have increased hearing sensitivity. These species are considered to be more sensitive to anthropogenic underwater noise sources than species such as cod (Gadus sp.), which do not possess a structure linking the swim bladder and inner ear. Fish species that either do not have a swim bladder (e.g. elasmobranchs (sharks and rays) and scombrid fish (mackerel and tunas)) or have a much-reduced swim bladder (e.g. flat fish) tend to have a relatively low auditory sensitivity.

Considering these differences in fish physiology, Popper et al. (2014) developed sound exposure guidelines for fish; these are presented in **Table 6-7** and are considered appropriate to assess continuous acoustic discharges to fish from the Petroleum Activities Program.

**Table 6-7: Impact thresholds to fish, sharks and rays for continuous noise**

| Receptor | Mortality and potential mortal injury | PTS | TTS | Masking | Behaviour |
|---|---|---|---|---|---|
| Fish: no swim bladder | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | (N) High<br>(I) High<br>(F) Moderate | (N) Moderate<br>(I) Moderate<br>(F) Low |
| Fish: swim bladder not involved in hearing | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | (N) High<br>(I) High<br>(F) Moderate | (N) Moderate<br>(I) Moderate<br>(F) Low |
| Fish: swim bladder involving hearing | (N) Low<br>(I) Low<br>(F) Low | 170 dB rms SPL for 48-hours | 158 dB rms SPL for 12-hours | (N) High<br>(I) High<br>(F) High | (N) High<br>(I) Moderate<br>(F) Low |

*Note: The sound units provided in the table above include:*

- *rms SPL: root mean square of time-series pressure level, useful for quantifying continuous noise sources.*
- *Relative risk (high, medium and low) is given for fish (all types) at three distances from the source defined in relative terms as near (N – tens of metres), intermediate (I – hundreds of metres) and far (F – thousands of metres) (after Popper et al. 2014).*

*Source: Popper et al. (2014).*

*Impact Assessment*

Maximum-over-depth horizontal distances to PTS and TTS thresholds for fish with a swim bladder involved in hearing as a result of underwater noise from a support vessel are approximately 10 m or less from the source based on modelling from JASCO for the Scarborough field (McPherson et al., 2019). For fish with a swim bladder not involved in hearing, and fish without a swim bladder (including whale sharks) the likelihood of PTS or TTS is low. Based on an intermediate spreading equation to estimate sound propagation loss from the MODU (15Log(R)), noise levels would drop below PTS and TTS thresholds for fish with a swim bladder involved in hearing within <15 m and 78 m respectively.

Given the thresholds outlined in **Table 6-7**, it is reasonable to expect that fish, sharks and rays may demonstrate avoidance or attraction behaviour to the noise generated by the Petroleum Activities Program. However, potential impacts from predicted noise levels from the project vessels (including MODU and support vessels) are not considered to be ecologically significant at a population level.

***Cumulative Impacts***

Cumulative impacts have been assessed above.

***Summary of Assessment Outcomes***

| Receptor | Impact | Receptor Sensitivity Level | Magnitude | Impact Significance Level |
|---|---|---|---|---|
| Marine mammals | Change in fauna behaviour<br>Injury / mortality to fauna | High value species (i.e. pygmy blue whale) | No lasting effect | Slight (E) |
| Marine reptiles | Change in fauna behaviour<br>Injury / mortality to fauna | High value species (i.e. flatback, green, hawksbill or loggerhead turtles) | No lasting effect | Slight (E) |
| Fish | Change in fauna behaviour<br>Injury / mortality to fauna | High value species | No lasting effect | Slight (E) |

***Overall Impact Significance Level:*** The overall impact significance level for routine acoustic emissions is E based on no lasting effect to the high value receptors (marine mammals, reptiles and fish). The impact significance levels for individual receptors are consistent with the level in the OPP.

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation Codes and Standards*** | | | | |
| EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[31]:<br>• Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution zone) and not approach closer than 100 m from a whale.<br>• Project vessels will not approach closer than 50 m for a dolphin ~~or~~ and/or 100 m for a whale (with the exception of animals bow riding).<br>• If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. | F: Yes.<br>CS: Minimal cost. Standard practice. | Implementation of controls for reduced vessel speed around cetaceans can potentially reduce the underwater noise footprint of a vessel and lower the likelihood of interaction above significant thresholds | Controls based on legislative requirements – must be adopted. | Yes<br>**C 3.1** |
| ***Good Practice*** | | | | |
| Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[32] | F: Yes.<br>CS: Minimal cost. Standard practice | Implementation of controls for reduced vessel speed around whale sharks can potentially reduce the underwater noise footprint of a vessel | F: Yes. | F: Yes.<br>**C 3.5** |
| Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone).<br>If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a | F: Yes.<br>CS: Minimal cost. Standard practice | Implementation of controls for reduced vessel speed around turtles can potentially reduce the underwater noise footprint of a vessel | F: Yes. | F: Yes.<br>**C 3.6** |

[31] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.
[32] For safety reasons, the distance requirements are not applied for a vessel holding station or with limited manoeuvrability e.g. lifting, loading, back-loading, bunkering, close standby cover for overside working and emergency situations

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| constant speed of less than 6 knots[33]. | | | | |
| Implement adaptive management procedure prior to and during MODU /installation vessel moves to the next well location, during daylight hours. Adaptive management procedure to include:<br>• Use of trained crew (both MODU and installation vessel)<br>• Monitoring 30 minutes prior to move and during the transit to the new well location<br>• MODU / installation vessel will not approach within 500 m of any pygmy blue whales and humpback whales<br>Where pygmy blue whale or humpback whale presence has been observed the area will not be approached, within 500 m, until there has been a period of 30 minutes with no pygmy blue whale(s) or humpback whale recorded | F: Yes<br>CS: Time / Cost associated with person used for observations. Schedule delays associated with waiting on pygmy blue whale and humpback whale activity to cease / move on. | Detecting pygmy blue whale and humpback whale activity in the area before MODU / installation vessel moves allows distance to be maintained and reduces the likelihood of impact or influence on pygmy blue whale or humpback whale activity. | Benefits outweigh cost/sacrifice. | Yes<br>**C 3.2** |
| Collect data on opportunistic sightings of pygmy blue whales to gauge presence and behaviour | F: Yes<br>CS: Time / Cost associated with person used for observations and in data collection | Collecting data on pygmy blue whale presence and behaviour may assist in increasing understanding of their activity in the PAA to inform future activities. | Benefits outweigh cost/sacrifice. | Yes<br>**C 3.3** |
| Use of aircraft to carry out visual observations for pygmy blue whale foraging activity (Aerial Survey). | F: Yes<br>CS: Time / cost associated with chartering aircraft and use of dedicated MFO's<br>Due to WA-61-L distance offshore actual observation times are limited by fuel availability - larger fuel capacity associated with larger aircraft | Aerial Surveys could assist in identifying pygmy blue whale foraging activity over a larger monitoring zone. | Cost/sacrifice outweighs benefit.<br><br>Due to distance of PAA from pygmy blue whale migration and foraging BIA's, presence of PBW's carrying out opportunistic foraging activities in the area is expected to be low. Adequate | No. |

[33] For safety reasons, the distance requirements are not applied for a vessel holding station or with limited manoeuvrability e.g. lifting, loading, back-loading, bunkering, close standby cover for overside working and emergency situations

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | increases cost of the exercise | | observations are able to be made from the MODU Bridge due to height and surveillance by trained crew. It is not expected that an aircraft would add significantly more value than this, to warrant deployment. | |
| ***Professional Judgement – Eliminate*** | | | | |
| Remove support vessel on standby at the Petroleum Activities Program location. | F: No. Activity support vessel required as per MODU Safety Case, particularly for maintaining the 500 m petroleum safety zone around the MODU/ installation vessel.<br>CS: Introduces unacceptable safety risk. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| Only use Moored MODU (no DP thruster noise). | F: Yes, it would be feasible to use a Moored MODU.<br>CS: Costs and schedule implications of waiting for a Moored MODU to be available, rather than selecting a DP MODU. | Eliminates DP thruster noise from the MODU | Cost/sacrifice outweighs benefit.<br><br>Woodside plans to use a DP MODU for technical capability, efficiency, and cost reasons. Cost and schedule implications of using a Moored MODU are grossly disproportionate to potential environmental gains given distance to Migratory BIA for PBW and low likelihood of presence of opportunistic foraging in PAA. | No |
| Eliminate generation of noise from the MODU, installation vessel, support vessels or survey positioning equipment. | F: No. The generation of noise from these sources cannot be eliminated due to operating requirements. Note that vessels operating on DP may be a safety critical requirement.<br>CS: Inability to conduct the Petroleum Activities | Not considered – control not feasible. | Not considered – control not feasible. | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | Program. Loss of project. | | | |
| Move support vessel(s) away from MODU (>2 km) if pygmy blue whale or humpback whale observed within 500 m – when support vessel is not being used to perform functionality as required by Safety Case | F: Yes<br>CS: Time / Cost associated with vessel moving and delay to activities which cannot be carried out without support vessel present and at required standby distance | Can reduce cumulative noise and potential reduction in likelihood of impact to pygmy blue whales and humpback whales | Benefits outweigh cost/sacrifice | Yes<br>**C 3.4** |
| ***Professional Judgement – Substitute*** | | | | |
| Management of vessel noise by varying the timing of the Petroleum Activities Program to avoid migration periods. | F: Not feasible due to total length of drilling campaign, planned batch drilling sequence and successive activities dependent upon completion timing of D&C campaign execution<br>CS: Significant cost and schedule impacts deeming the project unviable if activities avoid specific timeframes. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| ***Professional Judgement – Engineered Solution*** | | | | |
| Drone surveys to identify cetacean activities prior to well moves (during batch drilling) or initial entry into the Project Activity Area | F: Yes<br>CS: Cost of drone, pilot and other equipment required. Standby time for MODU or Installation vessel if cetaceans present. | Can reduce likelihood of encountering PBWs at a distance that may cause injury/impact or behavioural response.<br>Could give more reliability on whales and whether they are foraging | Cost/sacrifice outweighs benefit.<br>Due to distance of PAA from PBW migration and foraging BIA's, presence of PBW's carrying out opportunistic foraging activities in the area is low. Adequate observations are able to be made from the MODU Bridge due to height and surveillance by a trained MFO. It is not expected that a drone would add significantly more value than this, to warrant deployment. | No |
| Passive Acoustic Monitoring (PAM) | F: No. PAM has limited ability to detect calls from baleen whales | Not considered – control not feasible. | Not considered – control not feasible. | No. |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | such as the Pygmy Blue Whale, particularly with added background noise from drilling/ installation vessel activities and known reliability and practicality limitations of the technology.<br>CS: Costs associated with PAM technology acquisition and implementation. | | | |
| Use of thermal imaging equipment at night or periods of low visibility to identify cetacean presence. | F: Yes. Feasible to install on support vessel<br>CS: Costs associated with infrared technology acquisition and implementation. | Can increase likelihood of identifying cetacean presence however limitations on detection distance/depth, interpretation of data (identification of cetacean type for example) and practicality. | Cost/sacrifice outweighs benefit.<br>Lack of proven application in detection of cetaceans in deep water environment and limitations of the technology reduce potential benefit gained when compared with low likelihood of expected cetacean activity and low likelihood of MODU/ installation vessel movement at night. | No |
| Use of Autonomous Underwater Vehicle (AUV) to monitor for presence of pygmy blue whales using detection of their vocalisations. | F: Yes. Could be deployed from support vessel<br>CS: Costs associated with obtaining and operating the technology.<br>Schedule delays while data is collected and interpreted (not real time monitoring) | Limited benefit as the technology relies on Pygmy Blue Whale vocalisation, which is currently not well understood, particularly during foraging activities. Technology and applications still under development and not widely tested in field. Application limited due to lack of real time capability. | Cost/sacrifice outweighs benefit.<br>Due to distance of PAA from PBW migration and foraging BIA's, presence of PBW's carrying out opportunistic foraging activities in the area is expected to be low. Adequate observations are able to be made from the MODU Bridge due to height and surveillance by a trained crew. It is not expected that an AUV would add significantly more value than this, to warrant deployment. | No. |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |

**ALARP Statement:**

As identified in the DAWE and NOPSEMA guidance on key terms within the CMP, where it can be reasonably predicted that blue whale foraging is probable, known or whale presence is detected, adaptive management (**C3.2**) should be used during industry activities to prevent unacceptable impacts (i.e. no injury or biologically significant behavioural disturbance) to blue whales from underwater anthropogenic noise.

On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the potential impacts from noise emissions. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP.

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |

Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.1.4.3 of the Scarborough OPP (SA0006AF0000002, Rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**

- Overall impact significance levels for individual receptors are less than the significant impact level defined in the OPP.
- EPOs and controls in the OPP that are relevant to routine acoustic emissions have been adopted.
- Additional guidance on key terms within the Conservation Management Plan for the Blue Whale (the CMP) was issued in September 2021 and these were considered in the assessment against relevant actions in the CMP. The Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.
- There are no changes to internal context specific to this risk from the OPP.
- Impacts from routine acoustic emissions was raised during consultation (**Appendix F, Table 1**) and this feedback was considered in the finalisation of the EP.

***Acceptability Statement:***

The impact assessment has determined that the generation of noise from project vessels, MODU, and positioning equipment is unlikely to result in an impact significance level greater than slight. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice (**Section 6.9**).

The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of acoustic emissions to a level that is broadly acceptable.

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 3**<br>Undertake the Petroleum Activities Program in a manner that will not seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an | **C 3.1**<br>EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[34]:<br>• Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution | **PS 3.1.1**<br>Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans | **MC 3.1.1**<br>Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 |

[34] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| ecologically significant proportion of the population of a migratory species.<br>**EPO 4**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of fishes, marine mammals, marine reptiles, or the spatial distribution of a population.<br>**EPO 8**<br>Undertake the Petroleum Activities Program in a manner that will not substantially modify, destroy or isolate an area of important habitat for a migratory species. | zone) and not approach closer than 100 m from a whale.<br>• Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding).<br>• If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots.<br>• . | | Interacting with cetaceans. |
| | **C 3.2**<br>Implement adaptive management procedure prior to and during MODU /installation vessel moves to the next well location, during daylight hours. Adaptive management procedure to include:<br>• Use of trained crew (both MODU and installation vessel)<br>• Monitoring 30 minutes prior to move and during the transit to the new well location<br>• MODU / installation vessel will not approach within 500 m of any pygmy blue whales and humpback whales<br>• Where pygmy blue whale or humpback whale presence has been observed the area will not be approached, within 500 m, until there has been a period of 30 minutes with no pygmy blue whale(s) or humpback whale(s) recorded | **PS 3.2.1**<br>During moves to the next well location MODU or installation vessel will not approach within 500 m of pygmy blue whales or humpback whale(s) or an area where pygmy blue whales or humpback whale(s) were observed within the previous 30 minutes. | **MC 3.2.1**<br>Records demonstrate trained MODU/vessel crew on watch prior to moving to next well location<br>**MC 3.2.2**<br>Records demonstrate when PBW or humpback whale presence detected the MODU or installation vessel did not approach within 500 m. |
| | **C 3.3**<br>Collect data on opportunistic sightings of Pygmy Blue Whales to gauge presence and behaviour | **PS 3.3.1**<br>Process developed for collecting PBW sighting data<br>PBW sighting data sent to relevant organisations as required (i.e. Australian Marine Mammal Centre [AMMC]) | **MC 3.3.1**<br>Records demonstrate process developed and communicated to crew for collection of Pygmy Blue Whale siting data |
| | **C 3.4**<br>Move support vessel(s) away from MODU (>2 km) if pygmy blue whale(s) or humpback whale(s) observed within 500 m – when | **PS 3.4.1**<br>Support vessels relocate, where safety allows, from vicinity of the MODU when pygmy blue whale(s) or | **MC 3.4.1**<br>Records demonstrate support vessels relocated from |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | support vessel is not being used to perform functionality as required by Safety Case | humpback whale(s) are observed within 500 m of the MODU. | MODU vicinity when cetacean activity identified. |
| | **C 3.5**<br>Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[35] | **PS 3.5.1**<br>When within 250 m of a whale shark vessels will not travel greater than 6 knots and vessels will not approach closer than 30 m to a whale shark | **MC 3.5.1**<br>Records demonstrate no breaches of speed requirements when within 250 m of a whale shark |
| | **C 3.6**<br>Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone).<br>If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots[35]. | **C 3.6.1**<br>When within 300 m of a turtle, vessels will not travel greater than 6 knots. | **MC 3.6.1**<br>Records demonstrate no breaches of speed requirements when within 300 m of a turtle |

[35] For safety reasons, the distance requirements are not applied for a vessel holding station or with limited manoeuvrability e.g. lifting, loading, back-loading, bunkering, close standby cover for overside working and emergency situations

## 6.7.4 Physical Presence – Interaction with Other marine Users

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| Section 7.1.4 (Physical Presence – Displacement of Other Users) | | |
| **Context** | | |
| **Relevant Activities**<br>Installation of Subsea Infrastructure – **Section 3.8.10**<br>Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1**<br>Helicopter Operations – **Section 3.9.3**<br>Wellhead Assembly Left In-situ – **Section 3.10.8** | **Existing Environment**<br>Socio-economic Values – **Section 4.9** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Interaction with other marine users – proximity of MODU and project vessels interfering with or displacing third party vessels (commercial fishing and commercial shipping) | | | | | | | ✓ | A | E | - | - | LCS<br>GP<br>PJ | Broadly Acceptable | EPO .9, 10 |
| Presence of subsea infrastructure interfering with or displacing third party vessels (commercial fishing) | | | | | | | ✓ | | | | | | | |

**Description of Source of Impact/Risk**

***MODU and Vessel Operations***

The movement of vessels within the PAA, and the physical presence of the MODU and vessels, have the potential to displace other marine users.

The MODU will have a 500 m safety exclusion zone within the PAA for the duration of the Petroleum Activities Program. Woodside proposes to drill up to ten new development wells (two of which are contingency). Inspection, monitoring, maintenance and repair activities may also be conducted on any of the proposed new development wells within Permit Area WA-61-L. While wells may be batch drilled, only one well will be drilled at any given time. Drilling operations for the development wells is expected to take approximately 60 days per well to complete, including mobilisation, demobilisation and contingency. This is equivalent to 480 days for the eight planned wells (with an additional 120 days as required for the two contingent wells).

Subsea xmas trees are expected to be installed after completing the relevant sections of the well while the MODU is still in the field. Installation of subsea xmas trees is expected to have a cumulative duration of about 14 days (including mobilisation, demobilisation, and contingency).

The eight planned wells are currently scheduled to be drilled in a consecutive batch-drill sequence as described in **Section 3**. However, to allow flexibility in the execution of the Petroleum Activities Program, it has been assumed for the purposes of assessment that the MODU, subsea installation vessel and other vessels may be present at any time during the five-year approval period of the EP, for a combined period as described above.

Other vessels may also be required during the activities, including subsea support vessel for light well intervention (LWI) and other support vessels. Some vessels will need to transit in and out of the PAA to port for emergency and routine operations.

***Physical presence of subsea infrastructure***

The subsea xmas trees and wellheads will be located within the PAA. The physical presence of this infrastructure will remain for the duration of field life. Wellheads and xmas trees take up a small area on the seabed and will rise several metres above the seabed.

As described in **Section 3.10.2** wells may need to be abandoned if a respud is required. This is considered a contingent activity and if a well is abandoned due to respud, a reasonable attempt to remove the wellhead(s) will be made. Wellhead assemblies may be left in-situ if these reasonable attempts are unsuccessful. If a wellhead is left in-situ, it could potentially interfere with third-party activities (commercial fishing).

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

Interaction with other marine users due to the physical presence of in the Petroleum Activities Program may result in the following impact:

- Localised changes to the functions, interests or activities of other users.

The duration of change will be for the period of the Petroleum Activities Program.

***Commonwealth and State Managed Fisheries***

Four Commonwealth managed fisheries and six State managed fisheries overlap the PAA. Potential impacts to commercial fishers depend on the use of the area by fishers, in addition to the temporal and spatial extent of the presence of vessels and facilities/infrastructure.

Potential impacts to commercial fisheries include damage to fishing and loss of commercial catch due to displacement from fishing grounds. Damage to trawl nets could occur if they catch or snag on subsea infrastructure or wellhead assemblies. However, such infrastructure occupies a small area within the PAA only. One trawl fishery, the Western Deepwater Fishery overlaps the PAA. Trawl frequency assessment has shown that fishing activity occurs further south of the PAA, on the western edge of the 200 m isobath between Shark Bay and Ningaloo. Therefore, trawl activity within the PAA is not expected.

The presence of vessels (and MODU) in the PAA will present a surface hazard to fishing vessels and potentially result in a temporary exclusion from a small area as during:

drilling a 500 m safety exclusion zone will be required around the MODU

during xmas tree installation a 500 m exclusion zone will also be implemented for the installation vessel.

Given the distance offshore, the PAA is not an area of high commercial fishing activity. Furthermore, the 500 m temporary exclusion zones around the MODU and installation vessel comprises a relatively small area when compared to the extent of the individual fishery boundaries that overlap. As such, any displacement of commercial fisheries due to activities in the PAA are not expected to impact commercial fishing activities or the economic viability of the fisheries.

The magnitude of potential impacts to commercial fisheries from activities associated with the Petroleum Activities Program are assessed as having no lasting effect, as impacts will be temporary.

***Tourism and Recreation***

Tourism and recreation within the PAA are expected to be limited by the distance offshore and water depths. Consultation did not identify any key recreational fishing activity within the PAA. Given the location, and the short-term nature of activities, impacts to tourism and recreational activities are not expected, and have not been evaluated further.

***Shipping***

Shipping activity in the PAA is low, with no shipping fairways located within the PAA. Vessel traffic data shows that the majority of vessel movements occur to the south-east of the PAA. Given the short-term nature of the activities and the low level of shipping activity within the PAA, impacts to shipping are unlikely.

***Industry***

The NWS is an area of active oil and gas exploration and production. The closest facility to the PAA is the Woodside Pluto facility (approximately 160 km to the east). Displacement of, or interference with, other oil and gas activities are not expected within the PAA. Impacts to industry are therefore unlikely.

***Defence***

Defence activities in the vicinity of the PAA may include Naval vessel traffic and Air Force training exercises. Neither of these types of activities are expected to be a consistent presence in the area. The PAA is on the outer extent of the training area associated with the Learmonth Air Force Base. Department of Defence was notified, and no known

defence activities are planned (**Section 5**). Any potential interaction is expected to be minimal and not significantly different from interaction with other facilities within the northwest region.

| ***Summary of Assessment Outcomes*** | | | | |
|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity Level** | **Magnitude** | **Impact Significance Level** |
| Commonwealth Managed Fisheries | Changes to the function interests or activities of others | High value marine user | No Lasting Effect | Slight (E) |
| State Managed Fisheries | | High value marine user | No Lasting Effect | Slight (E) |
| | | | | |
| ***Overall Impact Significance Level:*** The overall impact significance level for Interaction with other marine users is slight based on no lasting effect to the high value receptor (commercial fisheries). The impact significance levels for individual receptors are consistent with the levels in the OPP. | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Vessels to adhere to the navigation safety requirements including the *Navigation Act 2012* and any subsequent Marine Orders. | F: Yes.<br>CS: Minimal cost. Standard practice. | The act regulates ship related activities and invokes certain requirements of MARPOL. Vessels (relevant to class) will adhere to requirements. | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice | Yes<br>**C 4.1** |
| Establishment of a 500 m petroleum safety zone around MODU and 500 m exclusion zone around the installation vessel. | F: Yes.<br>CS: Minimal cost. Standard practice. | Establishment of a 500 m petroleum safety zone around MODU and installation vessel reduces the likelihood of interaction with other marine users. | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice | Yes<br>**C 4.2** |
| Reasonable attempts at removal of wellhead(s) will be made in the event of a respud. | F: Yes.<br>CS: Additional cost. | In accordance with OPGGS Act Section 572 | Benefits outweigh cost/sacrifice. | Yes<br>**C 4.6** |
| ***Good Practice*** | | | | |
| Australian Hydrographic Office (AHO) will be notified of activities and movements no less than four working weeks prior to commencement of the Petroleum Activities Program. | F: Yes.<br>CS: Minimal cost. Standard practice. | Notification of AHO will enable them to update maritime charts thereby reducing the likelihood of interaction with other marine users. | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice. | Yes<br>**C 4.3** |
| Notify relevant government departments, fishing industry | F: Yes. | Communication of the Petroleum Activities | Benefits outweigh cost/sacrifice. | Yes<br>**C 4.4** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| representative bodies and licence holders of activities prior to commencement and upon completion of activities. | CS: Minimal cost. Standard practice. | Programme to other marine users ensures they are informed and aware, thereby reducing the likelihood of interference with other marine users. | Control is also Standard Practice. | |
| Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities and movements 24–48 hours before operations commence. | F: Yes.<br>CS: Minimal cost. Standard practice. | Communication of the Petroleum Activities Programme to other marine users ensures they are informed and aware, thereby reducing the likelihood of interference with other marine users. | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice. | Yes<br>**C 4.5** |
| Notify relevant persons and/ or organisations for activities within the Petroleum Activities Program that commence more than a year after EP acceptance. | F: Yes<br>CS: Minimal cost.<br>Standard Practice | Communicating the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of interfering with other marine users. | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice | Yes<br>**C 4.7** |
| Notify Defence of activities no less than five weeks before the scheduled activity commencement date | F: Yes<br>CS: Minimal cost.<br>Standard Practice | Communicating the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of interfering with other marine users. | Benefits outweigh cost/sacrifice. | Yes<br>**C 4.8** |
| ***Professional Judgement – Eliminate*** | | | | |
| Limit drilling activities to avoid peak shipping and commercial fishing activities. | F: No. Shipping occurs year-round and cannot be avoided. SIMOPS with fishing seasons cannot be eliminated as exact timings for all activities are not confirmed.<br>CS: Not considered – control not feasible | Not considered – control not feasible. | Not considered – control not feasible. | No |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Over-trawl protection on subsea infrastructure. | F: Yes. Over-trawl protection could mitigate against the potential for commercial fishing trawl gear to damage subsea infrastructure and/or result in loss of trawl gear.<br>CS: Significant additional cost. | Reduce the potential for snagging of trawl nets if a wellhead is left in situ following abandonment during drilling. However, given the low level of trawling activity occurring in the PAA, the benefit is low. | Disproportionate.<br>Significant additional costs. | No |
| **ALARP Statement:**<br>On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A; **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the impacts of the physical presence of the Petroleum Activities Program on other users.<br>As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.1.5.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall impact significance levels for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to the interaction with other users have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:***<br>The impact assessment has determined that, given the adopted controls, the Petroleum Activities Program is unlikely to result in an impact significance level greater than Slight.<br>The adopted controls are considered consistent with industry good practice and professional judgement and meet the requirements and expectations of Australian Marine Orders, AMSA, DPIRD, DOD and AHO identified during impact assessment and consultation. Further opportunities to reduce the impacts have been investigated above.<br>The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts from the physical of the Petroleum Activities Program to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 9**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on the sustainability of commercial fishing. | **C 4.1**<br>Vessels to adhere to the navigation safety requirements including the *Navigation Act 2012* and any subsequent Marine Orders. | **PS 4.1**<br>Activity support vessels and MODU compliant with Navigation Act and Marine Order 21 (Safety of navigation and emergency procedures) 2012 | **MC 4.1.1**<br>Marine assurance inspection records demonstrate compliance with standard maritime safety procedures |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 10**<br>Undertake the Petroleum Activities Program in a manner that does not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted. | **C 4.2**<br>Establishment of a 500 m petroleum safety zone around MODU and installation vessel and communicated to marine users. | **PS 4.2**<br>No entry of unauthorised vessels within the 500 m safety exclusion zone. | **MC 4.2.1**<br>Records demonstrate breaches by unauthorised vessels within the petroleum safety zone are recorded. |
| | | | **MC 4.2.2**<br>Consultation records demonstrate that AHO has been notified prior to commencement of the activity to allow generation of navigation warnings (Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) (including AUSCOAST warnings where relevant)), which communicate safety exclusion zones to marine users. |
| | **C 4.3**<br>Notify AHO of activities and movements no less than four working weeks prior to commencement of the Petroleum Activities Program. | **PS 4.3**<br>Notification to AHO of activities and movements to allow generation of navigation warnings (Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) (including AUSCOAST warnings where relevant)). | **MC 4.2.2**<br>**See above** |
| | **C 4.4**<br>Notify relevant government departments, fishing industry representative bodies and licence holders of activities prior to commencement and following completion of activities. | **PS 4.4**<br>Notification to AFMA, CFA, DAFF (fisheries), DPIRD, WAFIC, Recfishwest, individual relevant fishery licence holders (in the operational area) and other O&G operators (if agreed during consultation – refer to **Table 7-2**) ten days before activity commences, and following completion of activities. | **MC 4.4.1**<br>Consultation records demonstrate that relevant government departments, fishing industry representative bodies and licence holders have been notified prior to commencement and following completion of drilling. |
| | **C 4.5**<br>Notify AMSA JRCC of activities and movements 24–48 hours before operations commence. | **PS 4.5**<br>Notification to AMSA JRCC to prevent activities interfering with other marine users. AMSA's JRCC will require the MODU's details (including name, callsign and Maritime Mobile Service Identity (MMSI)), satellite | **MC 4.5.1**<br>Consultation records demonstrate that AMSA JRCC has been notified prior to commencement of the activity within required timeframes. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | | communications details (including INMARSAT-C and satellite telephone), area of operation, requested clearance from other vessels and need to be advised when operations start and end. | |
| | **C 4.6**<br>Reasonable attempt at removal of wellheads will be undertaken in the event of a respud. | **PS 4.6**<br>Removal of wellheads attempted during the Petroleum Activity Program in the event of a respud. | **MC 4.6.1**<br>Records demonstrate reasonable attempts at wellhead removal were made. |
| | **C 4.7**<br>Notify relevant persons and/ or organisations for activities within the Petroleum Activities Program that commence more than a year after EP acceptance. | **PS 4.7**<br>Relevant persons and/ or organisations will be notified no less than four working weeks prior to scheduled activity commencement date. | **MC 4.7.1**<br>Records demonstrate relevant persons and/ or organisations have been consulted. |
| | **C 4.8**<br>Notify Defence of activities no less than five weeks before the scheduled activity commencement date. | **PS 4.8**<br>Notification to Defence five weeks prior to the scheduled commencement date. | **MC 4.8**<br>Records demonstrate that Defence has been notified prior to commencement of the Petroleum Activities Program within the required timeframes. |

## 6.7.5 Physical Presence – Disturbance to Benthic Habitat from MODU Anchoring, Drilling Operations, Subsea Installation and ROV Operations

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| Section 7.1.6 | | |
| **Context** | | |
| **Relevant Activities**<br>Mooring Installation and Anchor Hold Testing – **Section 3.9.2.4**<br>Drilling Operations – **Section 3.8.1**<br>Installation of Subsea Infrastructure – **Section 3.8.10**<br>MODU Operations – **Section 3.9.1**<br>ROV Operations – **Section 3.9.4**<br>Subsea IMMR Activities – **Section 3.7**<br>Contingency Activities – **Section 3.10** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2**<br>Physical Environment – **Section 4.3**<br>Habitats and Biological Communities – **Section 4.5** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Disturbance to seabed from drilling operations | | ✓ | ✓ | | ✓ | | | A | D | - | - | GP<br>PJ | Broadly Acceptable | EPO 1,11, 28 |
| Mooring installation and anchor hold testing (moored MODU only) | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Placement and retrieval of seabed transponders (DP MODU and installation vessel) | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Installation of the subsea infrastructure and subsea IMR activities | | ✓ | ✓ | | ✓ | | | | | | | | | |
| ROV operations near the seabed (including localised sediment relocation) | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Wellhead assembly left in-situ in event of respud | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Removal of marine growth from infrastructure. | | ✓ | ✓ | | ✓ | | | | | | | | | |

**Description of Source of Impact/Risk**

***Drilling and MODU Operations***

The proposed development wells are planned to be drilled using a DP MODU; however, a moored MODU may be used as a contingency.

Dynamic positioning of the MODU uses satellite navigation and long baseline (LBL) transponders in conjunction with thrusters to maintain the position of the MODU at the required location. An array of transponders is proposed within a radius of 500 m from the proposed location of the wells and will be in place for a period of about three months per well. Transponders may be moored to the seabed either by a clump weight or mounted on a seabed frame. A typical seabed frame is 1.5 m × 1.5 m × 1.5 m in dimension. On completion of the positioning operation, the array transponders moored by clump weight will be recovered by means of a hydrostatic release and the clump weights removed from the seabed. The transponders mounted on seabed frames will be removed by ROV.

If a moored MODU is used, seabed disturbance will result from the MODU anchor mooring system and anchor hold testing, including placement of anchors and chain/wire on the seabed, potential dragging during tensioning, and recovery of anchors. Mooring may require an 8- to 12-point pre-laid mooring system at each well location, depending on the time of year. Suction piling may be required for installing the anchors.

Although the exact anchoring configurations are currently unknown, a conservative radius of 4000 m has been assessed, a semi-submersible MODU with an 8- to 12-point anchoring system could disturb up to 0.013 $km^2$ per well (13,000 $m^2$), allowing for anchor footprint and disturbance from anchor chains (NERA, 2018). For ten wells, this gives a total footprint of 0.13 $km^2$.

Drilling activities may result in intermittent or discontinuous direct physical or mechanical disturbance to the seabed up to an approximate 10 m radial distance around each new well location due to the installation of the BOP and conductor. Cementing of the conductor is carried out to secure the conductor in place and achieve adhesion between the conductor and subsurface. During this process cement is pumped into the space between the conductor and substrate until there is cement expression at seabed, to achieve acceptance criteria for the cement job and ensure adequate fatigue and structural support. The cement patio or excess cement at seabed is typically no more than 5 m radius, however disturbance to seabed has conservatively been calculated based on 10 m radius to account for general seabed disturbance in the vicinity of the wellhead from Petroleum Activities Program activities. Cement to seabed is minimised to ensure cement integrity down-well is maintained and reduce wastage / physical disturbance. There are no benefits to pumping excess cement to seabed. Disturbance to the seabed up to an approximate 10 m radial distance around each new well location due to the installation of the blow out preventor (BOP) and conductor (including cementing as described in **Section 3.8.1.2**), equates to around 314 $m^2$ per well, with a total of 3,140 $m^2$ (.00314 $km^2$) (based on 10 wells).

The generation and discharge of cuttings and drilling fluids are not considered in this section; refer to **Section 6.7.7** for an assessment of drill cuttings and drilling fluids.

The planned anchoring activities will be within the parameters defined in the *Anchoring of Vessels and Floating Facilities Environment Plan Reference Case* (Department of Industry, Innovation and Science, undated) for all anchoring activities undertaken by vessels and floating facilities (excluding FPSOs and FLNGs) while undertaking petroleum activities including:

- locations of water depth greater than 70 m; this boundary is set to exclude areas of sensitive marine primary producer habitats (e.g. corals, seagrass) that occur in shallower waters
- installation of moorings, buoys, equipment or other infrastructure for a period of up to two years
- wet storage on seabed of anchor chains, etc. during activities up to two years.

***Installation of the Subsea Infrastructure***

When the wells are completed, a subsea xmas tree will be installed onto each wellhead to prepare the wells for production. Xmas trees are planned to be vertically suspended approximately 10 m above the wellheads, and therefore should not contact the seabed. During xmas tree installation activities USBL may be installed on the seabed or mounted to the wellhead as required by the sub-sea installation activities.

***IMR Activities***

The subsea infrastructure will be inspected and maintained, and intervention may be required to repair identified issues. Subsea activities are typically performed from a relevant support vessel via an ROV or divers, and often require deployment of frames/baskets that are temporarily placed on the seabed. Typically, these have a perforated base with a seabed footprint of about 15 $m^2$. They are recovered to the vessel at the end of the activity.

Excess marine growth may need to be removed before undertaking subsea IMR activities and/or following return to wells after a period of suspended drilling. Removing marine growth is undertaken via a high-pressure water and/or brushes or acid, by ROV.

***ROV Operations***

The use of an ROV during activities as described may result in temporary seabed disturbance and suspension of sediment as a result of working close to, or occasionally on, the seabed. ROV use close to or on the seabed is limited to that required for effective and safe subsea activities. The footprint of a typical ROV is about 2.5 m × 1.7 m (4.25 $m^2$).

***Contingency Activities***

Woodside may need to intervene, workover or re-drill the proposed development wells within Permit Area WA-61-L. Any seabed disturbance would be the same as those described for Drilling Operations and MODU Operations. In

addition, in the event of a respud the base case would be to remove the wellhead infrastructure. However if reasonable attempts at wellhead removal are unsuccessful, a wellhead may remain in situ until the end of field life.

The ROV may be used to relocate sediment material around the well location (known as jetting) to help manage cement or cuttings flow.

## Detailed Impact Assessment

### *Assessment of Potential Impacts*

#### *Epifauna and Infauna*

Marine life such as deep water benthic communities epifauna and infauna (living on and in the sediment dominated habitat), may be impacted from the permanent placement of infrastructure (i.e. wellheads), or placement of temporary infrastructure (anchors, ROV) on the seabed. Disturbance to the seabed can alter the physical seabed habitat conditions, resulting in epifauna and infauna community changes (Newell et al., 1998). Subsea well installations are permanent for the duration of field life and will result in the displacement and/or permanent loss of epifauna and infauna within the physical footprint.

The seabed of the PAA is characterised by sparse marine life dominated by mobile organisms (ERM, 2013). The benthic biota are predominately deposit feeders such as epifauna (living on the seabed): shrimp (crustaceans) and sea cucumbers (echinoderms), and infauna (living within the surface sediments) small, burrowing worms (polychaetes) and crustaceans (ERM, 2013) (**Section 4.5**).

Habitat modification as a result of seabed disturbance could occur within a radius of up to 10 m from each well (10 wells in total). In proximity to this area benthic communities may be reduced or altered, leading to a highly localised impact to any epifauna and infauna benthic communities present. Potential impacts include; burial or smothering of benthic biota from localised sediment deposition, particularly to sessile epifauna such as sea pens and infauna (polychaetes), and sediment coating resulting from elevated turbidity/TSS potentially causing clogging or damage to the physiological functioning of certain biota (sea pens, polychaetes) reliant on external respiratory and feeding structures. Elevations in turbidity will be intermittent and temporary in nature depending on the phase of the activity (e.g., during installation, and/or ROV use etc.), and are not expected throughout the full 60 day campaign for each well. Further the sediment dispersed during these activities is naturally occurring and will settle under existing hydrodynamic conditions.

The deep-water environment is not oxygen saturated and oxygen levels in the water column at depth are substantially reduced as compared to the upper surface layers. Deep water benthic biota are adapted to such conditions which also include zero light and reduced temperature. Changes in oxygen levels resulting from the seabed infrastructure installation will be of short duration and temporary, furthermore, sediment quality sampling indicated low organic content (**Section 4.4**) and further depletion of oxygen levels due to organically rich sediment disturbance is not predicted. The seabed sediments of the PAA contain low levels of contaminants such as metals and no hydrocarbons (**Section 4.4**) so no toxicological impacts to benthic biota from disturbed sediments is predicted. The scale and magnitude of potential impacts will be limited to the offshore seabed infrastructure physical footprint area, representing a small proportion of the total area of deep water habitat and associated benthic communities of the PAA, that are known to be present in the wider region.

In the unlikely event that a wellhead cannot be removed following well abandonment (if required due to a respud), over time the cement surrounding the wellhead will likely become buried in sediment as a result of prevailing ocean currents. The steel wellhead structure is expected to accumulate marine growth, whereby a marine life structure may remain above the seafloor. If the wellhead remains in-situ, it is expected to have a localised impact not significant to environment receptors. No further impacts to benthic habitats are likely.

The use of water jetting to remove marine growth on subsea infrastructure will result in temporary suspension of organic matter and localised increase in turbidity. Water jetting will be limited to what is necessary to clean infrastructure for inspection, drilling or other activities to take place. No threatened or migratory species, or ecological communities (as defined under the EPBC Act), were identified in the benthic communities during studies completed in the PAA (ERM, 2013). The epifauna and infauna benthic communities known to exist in the PAA are likely to be well represented elsewhere in the region, with impacts restricted to a highly localised proportion of benthic communities.

The PAA is not located within or adjacent to an AMP.

#### *KEFs*

The Exmouth Plateau KEF overlaps the PAA and seabed disturbance may lead to a highly localised change in habitat and water quality, which will be short-term, associated with the temporal extent of drilling and installation activities (approximately 60 days per well). These potential short term impacts are unlikely to impact on the ecological value of the KEF.

The magnitude of potential impacts to epifauna and infauna from seabed disturbance during activities associated with the Petroleum Activities Program is Slight.

| ***Summary of Assessment Outcomes*** | | | | |
|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity Level** | **Magnitude** | **Impact Significance Level** |
| Epifauna and Infauna | Injury/mortality to fauna | Low value | Slight | Negligible (F) |
| KEFs | Change in habitat | High value habitat | Slight | Minor (D) |
| ***Overall Impact Significance Level:*** The overall impact significance level for disturbance to benthic habitat from MODU station keeping, drilling operations, subsea installation, ROV operations and contingency activities is D based on a slight impact to the high value receptor (KEFs). The impact significance levels for individual receptors are consistent with the level in the OPP. | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Reasonable attempt(s) at removal of wellheads will be undertaken in the event of a respud. | F: Yes<br>CS: Additional cost. Standard Practice. | In accordance with OPGGS Act Section 572 | Benefits outweigh cost/sacrifice. | Yes<br>**C 4.6** |
| Mooring systems (chains/wires and anchors) will be removed. | F: Yes<br>CS: Additional cost. Standard Practice. | In accordance with OPGGS Act Section 572 | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.1** |
| ***Good Practice*** | | | | |
| Subsea infrastructure will be positioned within the planned footprint to reduce seabed disturbance. | F: Yes.<br>CS: Standard practice. | Ensures risks appropriately addressed for seabed disturbance. | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.2** |
| Project-specific Basis of Well Design, which includes an assessment of seabed sensitivity. | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduces the likelihood of anchoring occurring in areas of high sensitivity. Assessment of seabed topography reduces the likelihood of anchor drag leading to seabed disturbance. | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.3** |
| Project-specific Mooring Design Analysis (for anchored MODU). | F: Yes.<br>CS: Additional costs associated with upgraded MODU mooring design. | The mooring design analysis determines the number and spread of anchors required based on sediment type and seabed topography, reducing the likelihood of anchor drag leading to seabed disturbance. | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.4** |
| Positioning technology used to place seabed infrastructure within the | F: Yes. | Use of positioning technology to position infrastructure on the | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.5** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| design footprint to reduce seabed disturbance | CS: Minimal cost. Standard practice. | seabed with accuracy will reduce seabed disturbance. | | |
| Environmental monitoring of the seabed prior to, and following the Petroleum Activities Program to assess any impacts to seabed. | F: Yes.<br>CS: Significant. Monitoring of the seabed, particularly the deep waters of the PAA, would have significant additional costs to obtain and analyse data with the spatial resolution to accurately assess changes to the seabed habitat. | Environmental monitoring would not result in any additional information of the seabed above the WLSADS and mooring design analysis. Therefore, no additional reductions in likelihood or consequence would occur. | Control grossly disproportionate. Monitoring will not reduce the consequence or likelihood of any impacts to the seabed, and the cost associated with the level of monitoring required to accurately assess any impacts greatly outweighs the benefits gained. | No |
| Unexpected finds of potential Underwater Cultural Heritage[36] sites / features, including first nations UCH are managed in accordance with the Unexpected Finds Procedure set out in **Section 7.4** | F: Yes<br>CS: Costs of implementation | Allows management of new finds in accordance with legislative requirements, expert advice and community expectations. | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.6** |
| Relevant vessel and MODU crew will be advised in an induction of the potential to encounter UCH, and of their requirement to follow the Unexpected Finds Procedure (C 5.6) | F: Yes<br>CS: Minimal | Ensures workforce as suitably aware of legal and process requirements for managing cultural features and heritage values. | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.7** |
| Report any potential UCH finds to relevant stakeholders and authorities in accordance with the Unexpected Finds Procedure, *Underwater Cultural Heritage Act 2018* and the ATSIHP Act | F: Yes<br>CS: Minimal | Meets legislative requirements and community expectations. | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.8** |
| ***Professional Judgement – Eliminate*** | | | | |

[36] Underwater Cultural Heritage is defined as any trace of human existence that has a cultural, historical or archaeological character and is located under water, in accordance with the UCH Act

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Only use DP MODU (no anchoring required). | F: Yes, it would be feasible to use a DP MODU.<br>CS: Costs and schedule implications of waiting for a DP MODU to be available, rather than selecting a moored MODU. | Eliminates seabed disturbance and associated impacts to benthic communities from anchor placement and movement. | Cost/sacrifice outweigh benefit.<br>Control would eliminate environmental impact from anchoring, however impacts are assessed as having a low consequence.<br>While Woodside plans to use a DP MODU, flexibility is required to meet potential contractual and operational constraints. Costs of implementation are disproportionately higher than the environmental gains | No |
| Do not use ROV close to, or on, the seabed. | F: No. The use of ROVs (including work close to or occasionally landed on the seabed) is critical as the ROV is the main tool used to guide and manipulate equipment during drilling. ROV usage is already limited to only that required to conduct the work effectively and safely. Due to visibility and operational issues ROV work on or close to the seabed is avoided unless necessary.<br>CS: Not assessed, control not feasible. | Not assessed, control not feasible. | Not assessed, control not feasible. | No |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| No additional controls identified. | | | | |
| **ALARP Statement:**<br>On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the impacts of seabed disturbance from activities associated with the Petroleum Activities Program. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.1.6.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall impact significance levels for individual receptors are consistent with the levels rated in the OPP.<br>• EPOs and controls in the OPP that are relevant to disturbance to benthic habitats have been adopted.<br>• There are no changes to internal context specific to this risk from the OPP<br>• Impacts to seabed disturbance was raised during consultation (**Appendix F, Table 1**) and this feedback was considered in the finalisation of the EP. |
| ***Acceptability Statement:***<br>The impact assessment has determined that, given the adopted controls, the Petroleum Activities Program is unlikely to result in an impact significance level greater than Minor. Further opportunities to reduce the impacts have been investigated above. The adopted controls are considered consistent with industry good practice and meet the requirements of Woodside relevant systems and procedures.<br>The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of disturbance to benthic habitat to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| **EPO** | **Adopted Control(s)** | **EPS** | **MC** |
| **EPO 1**<br>Undertake the Petroleum Activities Program in a manner that will not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results.<br>**EPO 11**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial change to water quality that may adversely impact on biodiversity, ecological integrity, social amenity or human health.<br>**EPO 28**<br>No adverse impact to unexpected finds of Underwater Cultural | **C 5.1**<br>Mooring systems (chains/wires and anchors) will be removed | **PS 5.1**<br>Mooring systems (chains/wires and anchors) removed during the Petroleum Activity Program | **MC 5.1**<br>Records demonstrate mooring systems removed. |
| | **C 5.2**<br>Seabed infrastructure will be positioned within the planned footprint to reduce seabed disturbance. | **PS 5.2**<br>All infrastructure will be placed within the PAA. | **MC 5.2.1**<br>As built surveys verify location installation of equipment within the PAA. |
| | **C 5.3**<br>Project- specific Basis of Well Design, which includes an assessment of seabed sensitivity. | **PS 5.3**<br>MODU/installation vessel well site locations consider seabed sensitivities. | **MC 5.3.1**<br>Records that Basis of Well Design includes the assessment of seabed sensitivities. |
| | **C 5.4**<br>Project-specific Mooring Design Analysis (for anchored MODU). | **PS 5.4**<br>Seabed disturbance from MODU mooring limited to that required to ensure adequate MODU station holding capacity. | **MC 5.4.1**<br>Records demonstrate Mooring Design Analysis completed and implemented during anchor deployment. |
| | **C 5.5**<br>Positioning technology used to place seabed infrastructure within the design footprint to reduce seabed disturbance. | **PS 5.5.1**<br>Infrastructure will be positioned in the planned location[38] where impacts have been assessed. | **MC 5.5.1**<br>As-built surveys verify installation of equipment within acceptable tolerance[5]. |
| | | **PS 5.5.2** | **MC 5.5.2** |

[38] Acceptable tolerance is considered to be ±150 m, given the homogenous and low sensitivity habitat.

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| **EPO** | **Adopted Control(s)** | **EPS** | **MC** |
| Heritage without a permit[37]. | | Transponder equipment, including clump weights/frames, will be removed at the end of the Petroleum Activity Program. | Records demonstrate removal of transponder equipment. |
| | **C 4.6**<br>Reasonable attempt(s) at removal of wellheads will be undertaken in the event of a respud. | **PS 4.6.1**<br>Refer **Section 6.7.4** | **MC 4.6.1**<br>Refer **Section 6.7.4** |
| | **C 5.6**<br>Unexpected finds of potential Underwater Cultural Heritage[39] sites / features, including first nations UCH are managed in accordance with the Unexpected Finds Procedure set out in **Section 7.4** | **PS 5.6**<br>In the event that an underwater cultural heritage site or feature is identified implement the Unexpected Finds Procedure set out in **Section 7.4**. | **MC 5.6.1**<br>No non-compliance with the Unexpected Finds Procedure. |
| | **C 5.7**<br>Relevant vessel and MODU crew will be advised in an induction of the potential to encounter UCH, and of their requirement to follow the Unexpected Finds Procedure (C 5.6) | **PS 5.7**<br>Relevant vessel and MODU crew are made aware of the requirements of the Unexpected Finds Procedure (C 5.6) through an induction. | **MC 5.7.1**<br>Records demonstrate vessel crew are made aware of potential to encounter UCH. |
| | **C 5.8**<br>Report any potential UCH finds to relevant stakeholders and authorities in accordance with the Unexpected Finds Procedure, *Underwater Cultural Heritage Act 2018* and the ATSIHP Act | **PS 5.8**<br>Report any finds of potential UCH in accordance with the Unexpected Finds Procedure (**Section 7.4**) including to:<br>• WA Museum as requested during EP consultation<br>• Australasian Underwater Cultural Heritage Database | **MC 5.8.1**<br>Records of potential UCH finds reported to relevant authorities and stakeholders. |

[37]Permit for Entry into a Protected Zone or to Impact Underwater Cultural Heritage would be acquired under the UCH Act.
[39] Underwater Cultural Heritage is defined as any trace of human existence that has a cultural, historical or archaeological character and is located under water, in accordance with the UCH Act

## 6.7.6 Routine and Non-Routine Discharges: MODU and Project Vessels

| **Scarborough OPP – Relevant Impact Assessment Section** | | |
|---|---|---|
| Section 7.1.7 (Routine and Non-Routine Discharges: Sewage and Greywater)<br>Section 7.1.8 (Routine and Non-Routine Discharges: Food Waste)<br>Section 7.1.9 (Routine and Non-Routine Discharges: Chemicals and Deck Drainage)<br>Section 7.1.10 (Routine and Non-Routine Discharges: Brine and Cooling Water) | | |
| **Context** | | |
| **Relevant Activities**<br>Subsea Equipment Preservation – **Section 3.8.7**<br>Maintenance and Repair – **Section 3.8**<br>Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2**<br>Habitats and Biological Communities – **Section 4.5** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Routine discharge of sewage, grey water and putrescible wastes to marine environment from MODU and project vessels | | | ✓ | | | ✓ | | A | E | - | - | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 11, 12, 13 |
| Routine discharge of deck and bilge water to marine environment from MODU and project vessels | | | ✓ | | | ✓ | | A | E | - | - | | | |
| Routine discharge of brine or cooling water to the marine environment from MODU and project vessels. | | | ✓ | | | ✓ | | A | F | - | - | | | |

**Description of Source of Impact/Risk**

***Vessel and MODU Operations***

Sewage, grey water and putrescible wastes

The MODU and project vessels routinely generate/discharge small volumes of treated sewage, putrescible wastes and grey water to the marine environment (impact assessment based on approximate discharge of 15 $m^3$ per vessel/MODU per day), using an average volume of 75 L/person/day and a maximum of 200 persons on board. However, it is noted that vessels such as support vessels will have considerably less persons on board.

Deck and bilge water

The MODU and project vessels routinely generate/discharge:

- Routine/periodic discharge of relatively small volumes of bilge water. Bilge tanks receive fluids from many parts of the project vessels or MODU. Bilge water can contain water, oil, detergents, solvents, chemicals, particles, biocides and other liquids, solids or chemicals.
- Variable water discharge from MODU/vessel decks directly overboard or via deck drainage systems. Sources could include rainfall events and/or deck activities such as cleaning/wash-down of equipment/decks.

Brine

Reverse osmosis (RO), distillation or desalination plants on board vessels and the MODU use seawater to produce potable and demineralised water; resulting in reject brine (i.e. hypersaline water) that is discharged to the marine environment. The potable water produced is stored in tanks on board.

During the distillation process, relatively small volumes of reject brine is produced and discharged. Reject brine discharge is typically 20–50% higher in salinity than the intake seawater (depending on the desalination process used) and may contain low concentrations of scale inhibitors and biocides, which are used to avoid fouling of pipework (Woodside, 2014).

Models developed by the US EPA (Frick et al., 2001) for temporary brine discharges from vessels assuming no ocean current (i.e. 0 m/s) found that brine discharges from the surface dilute 40–fold at 4 m from the source. This modelling can be used as an indicator for predicting horizontal attenuation and diffusion of reject brine; and suggests that the salinity concentration drops below environmental impact thresholds within 4 m of the discharge point.

Cooling Water

Seawater is used as a heat exchange medium for cooling machinery engines and other equipment. Seawater is drawn up from the ocean, where it is subsequently de-oxygenated and sterilised by electrolysis (by release of chlorine from the salt solution) and then circulated as coolant for various equipment through the heat exchangers (in the process transferring heat from the machinery), prior to discharge to the ocean. Upon discharge, it will be warmer than the ambient water temperature. Cooling water is often treated with additives including scale inhibitors and biocide to avoid fouling of pipework. Scale inhibitors and biocide are usually used at low dosages, and are usually consumed in the inhibition process, so there is little or no residual chemical concentration remaining upon discharge.

In some instances, fresh water or central cooling systems may be fitted. In these systems, fresh water is used in a closed circuit to cool down the engine room machinery, and then further cooled by sea water in a seawater cooler.

Seawater used for cooling purposes will be routinely discharged at a temperature expected to be less than 70 °C and rates ~50 m³/d.

Environmental risks relating to the unplanned disposal/discharges are addressed in **Section 6.8.4** and **6.8.6.**

## Detailed Impact Assessment

### *Assessment of Potential Impacts*

***Water Quality***

*Sewage, grey water and putrescible wastes*

The principal environmental impact associated with ocean disposal of sewage and other organic wastes (i.e. putrescible waste) is eutrophication. Eutrophication occurs when the addition of nutrients, such as nitrates and phosphates, causes adverse changes to the ecosystem, such as oxygen depletion and phytoplankton blooms. Other contaminants of concern occurring in these discharges may include ammonia, E. coli, faecal coliform, volatile and semi-volatile organic compounds, phenol, hydrogen sulphide, metals, surfactants and phthalates.

Woodside conducted monitoring of sewage discharges at its Torosa-4 Appraisal Drilling campaign which demonstrated that a 10 m³ sewage discharge reduced to about 1% of its original concentration within 50 m of the discharge location. In addition to this, monitoring at distances 50 m, 100 m and 200 m downstream of the platform and at five different water depths confirmed that discharges were rapidly diluted; no elevations in water quality monitoring parameters (e.g. total nitrogen, total phosphorous and selected metals) were recorded above background levels at any station (Woodside, 2011). Mixing and dispersion would be further facilitated in deep offshore waters, consistent with the location of the PAA, through regional wind and large scale current patterns resulting in the rapid mixing of surface and near surface waters where sewage discharges may occur. Studies investigating the effects of nutrient enrichment from offshore sewage discharges indicate that the influence of nutrients in open marine areas is much less significant than that experienced in enclosed areas (McIntyre and Johnston, 1975).

Given the offshore location, any routine and non-routine discharges of sewage and greywater and putrescible wastes from activities associated with the Petroleum Activities Program will result in no lasting change to water quality.

Activities associated with the Petroleum Activities Program will occur over a period of five years (2022-2027), however actual project activities are expected to take up to approximately 600 days in total, therefore project vessels and the MODU will not be continuously in the PAA during this time. Vessels will also be moving (i.e. not in a single location for an extended period of time). Rather, these routine discharges are expected to be intermittent in nature for the duration

of the Petroleum Activities Program. Therefore, impacts to water quality within the PAA are expected to be localised with no lasting effect.

*Deck and bilge water*

Deck drainage and treated bilge may contain a range of chemicals, oil, grease and solid material. This particulate matter can cause an increase in the turbidity of the receiving waters close to the point of discharge. The addition of these substances into the marine environment will result in a change ambient water quality; however, these discharges are expected to rapidly dilute in the water column (Shell, 2010). Discharges will disperse and dilute rapidly, with concentrations significantly dropping with distance from the discharge point.

Bilge water and deck drainage discharges, which may include non-organic contaminants, will rapidly dilute. As such, no significant impacts from the planned routine discharges are anticipated, because of the minor quantities involved, the expected localised mixing zone and high level of dilution into the open water marine environment of the PAA. The involved is located more than 12 nm from land, which exceeds the exclusion zones required by Marine Order 96 (Marine pollution prevention – sewage) 2018 and Marine Order 95 (Marine pollution prevention – garbage) 2013.

Based on the detailed evaluation, the magnitude of potential impact of a change in water quality is no lasting effects.

*Brine or cooling water*

The key physicochemical stressors that are associated with reject brine and cooling water discharge include salinity, pH, temperature and chemical toxicity.

Water quality of the surrounding environment may be altered through the addition of chemicals and an increase in salinity. Scale inhibitors and biocides are commonly used within the systems described above to prevent fouling. Scale inhibitors are typically low molecular weight phosphorous compounds that are water-soluble, and only have acute toxicity to marine organisms about two orders of magnitude higher than typically used in the water phase (Black et al., 1994). The biocides typically used in the industry are highly reactive and degrade rapidly (Black et al., 1994).

The potential impacts on water quality due to cooling water discharge include chlorine toxicity and increased water temperatures.

Reject brine water is typically 20 to 50% higher in salinity to the surrounding water and, based on models developed by the US EPA (Frick et al., 2001), discharges of brine water will sink through the water column where it will be rapidly mixed with receiving waters and dispersed by ocean currents, decreasing in salinity rapidly as distance from source increases.

Generally, reject brine and cooling water containing chemical additives are inherently safe at the low dosages used. They are usually consumed in the inhibition process, so there is little or no residual chemical concentration remaining upon discharge.

Woodside undertook modelling of continuous wastewater discharges (including cooling water) for its Torosa South-1 drilling program in the Scott Reef complex (Woodside, 2014). This study predicted that discharge water temperature decreases quickly as it mixes with the receiving waters, with the discharge water temperature being <1 °C above ambient within 100 m (horizontally) of the discharge point, and 10 m vertically (Woodside, 2014).

As such, any potential impacts to water quality are expected to be limited to 100 m of the source of the discharge where concentrations are highest.

Based on the detailed risk evaluation, the magnitude of the potential impact of a change in water quality from routine and non-routine brine and cooling water discharges is assessed as no lasting effect.

***Seabirds and Migratory Shorebirds, Fish, Marine Reptiles and Marine Mammals***

It is possible that marine fauna transiting the localised area may come into contact with these discharges (e.g. marine turtles, humpback whales, whale sharks; **Section 4.6**) as they traverse the PAA. However, given the localised extent of cumulative impacts from multiple vessel discharges and limited exposure, within the PAA, significant impacts to marine fauna are not expected.

***Plankton***

Research suggests that zooplankton composition and distribution are not affected in areas associated with sewage dumping grounds (McIntyre and Johnston, 1975). Plankton communities are expected to rapidly recover from any such short term, localised impact, as they are known to have naturally high levels of mortality and a rapid replacement rate.

Discharged brine sinks through the water column where it is rapidly mixed with receiving waters and dispersed by ocean currents. As such, any potential impacts are expected to be limited to the source of the discharge where concentrations are highest. Studies indicate that effects from increased salinity on planktonic communities in areas of high mixing and dispersion are generally limited to the point of discharge only (Azis et al., 2003).

Planktonic productivity in the NWMR is low. No significant impacts from the planned routine discharges are expected, because of the minor quantities involved, the expected localised mixing zone and high level of dilution into the open water marine environment of the PAA. The PAA is located more than 12 nm from land, which exceeds the exclusion zones required by Marine Order 96 (Marine pollution prevention – sewage) 2018 and Marine Order 95 (Marine pollution prevention – garbage) 2013.

Based on the impact assessment, the magnitude of the potential impacts on plankton from routine and non-routine brine and cooling water discharges is assessed as no lasting effect.

| ***Summary of Assessment Outcomes*** | | | | |
|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity Level** | **Magnitude** | **Impact Significance Level** |
| Water quality | Change in water quality | Low value (open water) | No lasting effect | Negligible (F) |
| Migratory Shorebirds and Seabirds | Injury/mortality to fauna | High value species | No lasting effect | Slight (E) |
| Fish | | High value species | No lasting effect | Slight (E) |
| Marine Mammals | | High value species | No lasting effect | Slight (E) |
| Marine Reptiles | | High value species | No lasting effect | Slight (E) |
| Plankton | | Low value (open water) | No lasting effect | Negligible (F) |
| ***Overall Impact Significance Level:*** The overall impact significance level for routine and non-routine discharges is E based on no lasting effect to the high value receptors (marine fauna). The impact significance level for water quality is consistent with the level in the OPP. Potential impacts to migratory shorebirds and seabirds have been additionally assessed in this EP and there is no change in magnitude of impact (no lasting effect). | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Marine Order 96 – Pollution prevention – Sewage (as appropriate to vessel class) which include the following requirements:<br>• a valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class<br>• an AMSA-approved sewage treatment plant<br>• a sewage comminuting and disinfecting system<br>• a sewage holding tank sized appropriately to contain all generated waste (black and grey water);<br>• discharge of sewage which is not comminuted or disinfected will only occur at a distance of | F: Yes.<br>CS: Minimal cost. Standard practice. | No reduction in likelihood or consequence would result. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 6.1** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| more than 12 nm from the nearest land<br>• discharge of sewage which is comminuted or disinfected using a certified approved sewage treatment plant will only occur at a distance of more than 3 nm from the nearest land<br>• discharge of sewage will occur at a moderate rate while support vessel is proceeding (more than 4 knots), to avoid discharges in environmentally sensitive areas. | | | | |
| Marine Order 95 – Pollution prevention – Garbage (as appropriate to vessel class) which requires putrescible waste and food scraps are passed through a macerator so that it is capable of passing through a screen with no opening wider than 25 mm. | F: Yes.<br>CS: Minimal cost. Standard practice. | No reduction in likelihood or consequence would result. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 6.2** |
| Where there is potential for loss of primary containment of oil and chemicals on the MODU, deck drainage must be collected via a closed drainage system. E.g. drill floor. | F: Yes.<br>CS: Minimal cost. Standard practice. | Requirements for deck drainage and management of oily water would reduce the likelihood of contaminated deck drainage water being discharged to the marine environment. No change in consequence would occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 6.3** |
| Marine Order 91 – Oil (as relevant to vessel class) requirements, which include mandatory measures for the processing of oily water prior to discharge:<br>• Machinery space bilge/oily water shall have International Maritime Organisation (IMO) approved oil filtering equipment (oil/water separator) with an on-line monitoring device to | F: Yes.<br>CS: Minimal cost. Standard practice. | No reduction in likelihood or consequence would result. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 6.4** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| measure Oil in Water (OIW) content to be less than 15 ppm prior to discharge.<br>• IMO approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capably of recirculating in the event that OIW concentration exceeds 15 ppm.<br>• A deck drainage system shall be capable of controlling the content of discharges for areas of high risk of fuel/oil/grease or hazardous chemical contamination.<br>• There shall be a waste oil storage tank available, to restrict oil discharges.<br>• In the event that machinery space bilge discharges cannot meet the oil content standard of <15 ppm without dilution or be treated by an IMO approved oil/water separator, they will be contained on-board and disposed of onshore.<br>• Valid International Oil Pollution Prevention Certificate. | | | | |
| Chemicals will be selected with the lowest practicable environmental impacts and risks subject to technical constraints. | F: Yes.<br>CS: Minimal cost. Standard practice. | Environmental assessment of chemicals will reduce the consequence of impacts resulting from discharges to the marine environment by ensuring chemicals have been assessed for environmental acceptability. Planned discharges are required for safely executing activities; therefore, no reduction in likelihood can occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 6.5** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Good Practice*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Eliminate*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Substitute*** | | | | |
| Storage, transport and treatment/disposal onshore of sewage, greywater and putrescible waste. | F: Not feasible. Would present additional safety and hygiene hazards resulting from the storage, loading and transport of the waste material.<br>Distance of activity offshore also makes the implementation of this control not feasible.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| ***Professional Judgement – Engineered Solution*** | | | | |
| No additional controls identified. | | | | |
| **ALARP Statement:**<br>On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the impacts of planned (routine and non-routine) discharges from MODU/vessels. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.1.7.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall impact significance levels for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to routine discharges have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:***<br>The impact assessment has determined that, given the adopted controls, routine and non-routine discharges from the MODU and project vessels are unlikely to result in an impact significance level greater than slight. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. The adopted controls are considered consistent with industry legislation, codes and standards, and professional judgement and meet the requirements of Australian Marine Orders.<br>The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of these discharges to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 11**<br>Undertake the Petroleum Activities Program in a manner that does not result in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health.<br>**EPO 12**<br>Undertake Scarborough activities in a manner that prevents a substantial adverse effect on a population of plankton including its life cycle and spatial distribution.<br>**EPO 13**<br>Undertake the Petroleum Activities Program in a manner which does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in an area defined as a Key Ecological Feature. | **C 6.1**<br>Marine Order 96 - pollution prevention – sewage (as appropriate to vessel class) which include the following requirements:<br>• a valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class<br>• an AMSA-approved sewage treatment plant<br>• a sewage comminuting and disinfecting system<br>• a sewage holding tank sized appropriately to contain all generated waste (black and grey water)<br>• discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 nm from the nearest land<br>• discharge of sewage which is comminuted or disinfected using a certified approved sewage treatment plant will only occur at a distance of more than 3 nm from the nearest land<br>• discharge of sewage will occur at a moderate rate while support vessel is proceeding (more than 4 knots), to avoid discharges in environmentally sensitive areas. | **PS 6.1**<br>MODU and project vessels compliant with Marine Order 96 – Pollution prevention – Sewage (as appropriate to vessel class). | **MC 6.1.1**<br>Records demonstrate MODU and project vessels are compliant with Marine Order 96 – Pollution prevention – Sewage (as appropriate to vessel class). |
| | **C 6.2**<br>Marine Order 95 – Pollution prevention – Garbage (as appropriate to vessel class) which requires putrescible waste and food scraps are passed through a macerator so that it is capable of passing through | **PS 6.2**<br>MODU and project vessels compliant with Marine Order 95 – Pollution prevention – Garbage. | **MC 6.2.1**<br>Records demonstrate MODU and project vessels are compliant with Marine Order 95 – Pollution prevention (as appropriate to vessel class). |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | a screen with no opening wider than 25 mm. | | |
| | **C 6.3**<br>Where there is potential for loss of primary containment of oil and chemicals on the MODU, deck drainage must be collected via a closed drainage system. E.g. drill floor. | **PS 6.3**<br>Contaminated drainage contained, treated and/or separated prior to discharge. | **MC 6.3.1**<br>Records demonstrate MODU has a functioning bilge/oily water management system. |
| | **C 6.4**<br>Marine Order 91 – oil (as relevant to vessel class) requirements, which include mandatory measures for the processing of oily water prior to discharge:<br>• Machinery space bilge/oily water shall have International Maritime Organisation (IMO) approved oil filtering equipment (oil/water separator) with an on-line monitoring device to measure Oil in Water (OIW) content to be less than 15 ppm prior to discharge.<br>• IMO approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capably of recirculating in the event that OIW concentration exceeds 15 ppm.<br>• A deck drainage system shall be capable of controlling the content of discharges for areas of high risk of fuel/oil/grease or hazardous chemical contamination.<br>• There shall be a waste oil storage tank available, to restrict oil discharges.<br>• In the event that machinery space bilge discharges cannot meet the oil content | **PS 6.4**<br>Discharge of machinery space bilge/oily water will meet oil content standard of <15 ppm without dilution. | **MC 6.4.1**<br>Records demonstrate discharge specification met for MODU and project vessels. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | standard of less than 15 ppm without dilution or be treated by an IMO approved oil/water separator, they will be contained on-board and disposed of onshore.<br>• Valid International Oil Pollution Prevention Certificate. | | |
| | **C 6.5**<br>Chemicals will be selected with the lowest practicable environmental impacts and risks subject to technical constraints. | **PS 6.5**<br>Reduces to ALARP the impact potential of all chemicals intended or likely to be discharged into the marine environment | **MC 6.5.1**<br>Records demonstrate chemical selection, assessment and approval process for selected chemicals is followed. |

## 6.7.7 Routine and Non-Routine Discharges: Drill Cuttings and Drilling Fluids

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| Section 7.1.12 (Routine and Non-Routine Discharges: Drilling) | | |
| **Context** | | |
| **Relevant Activities**<br>Drilling Activities – **Section 3.8**<br>Contingency Activities – **Section 3.10** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2**<br>Habitats and Biological Communities – **Section 4.5**<br>Protected Species – **Section 4.6** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | | ***Evaluation*** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Routine discharge of WBM drill cuttings to the seabed and the marine environment | | ✓ | ✓ | | ✓ | | | A | D | - | - | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 1, 11, 12, 13, 14, 15 |
| Routine discharge of treated NWBM drill cuttings to the marine environment | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Routine discharge of drilling muds (WBM) to the seabed and the marine environment | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Non-routine discharge of wash water from mud pits and vessel tank wash fluids | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Routine discharge of well clean-out fluids | | ✓ | ✓ | | ✓ | | | | | | | | | |
| Non-routine discharge of well annular fluids | | ✓ | ✓ | | ✓ | | | | | | | | | |

**Description of Source of Impact/Risk**

***Drilling Operations***

Up to ten development wells (two of which are a contingency) are planned to be drilled during the Petroleum Activities Program, which will result in the same number of discharge locations. Each well is expected to take approximately 60 days to drill. Drilling activities generate drill cuttings, require cementing of the casing, and require the use of a range of fluids. Throughout the drilling program several different fluids are to be run through the closed circulation system including, but not limited to, drilling fluids (water-based muds and non water-based muds), sea water, and kill-weight brine. It is noted that non water-based muds will be used as a contingency only.

Routine drilling discharges will include:

- drill cuttings
- drilling fluids (direct to seabed [WBMs only], retained on cuttings and bulk discharge of mud pits [WBMs only])

Non-routine drilling discharges may include:

- drill cuttings and fluids generated due to respud or side tracking
- well intervention and use of fluids (subsea control, completions and well annular fluids).

***Drill Cuttings and Fluids***

The primary discharges used as the basis of the impact assessment for this Petroleum Activities Program are as follows:

- Drill cuttings: drilling generates drill cuttings due to the breakup of solid material from within the borehole. The resultant drill cuttings are basically rock particles of various shapes, with sizes typically ranging from very fine to very coarse.
- Drilling fluids: serve many purposes including maintaining borehole stability and hydrostatic pressure, reducing friction and cleaning/ cooling of the drill bit, in addition to acting as a medium to carry cuttings from the well bore and return them to the surface at seabed or on the MODU. There are two main types of drilling fluids as follows:
  - Water based muds (WBMs) consists mainly of fresh water or seawater with the addition of chemical and mineral additives to aid in its function. Drilling additives typically used may include chlorides (e.g. sodium, potassium), bentonite (clay), cellulose polymers, guar gum, barite or calcium carbonate. These additives are either completely inert in the marine environment, naturally occurring benign materials, or readily biodegradable organic polymers with a very fast rate of biodegradation in the marine environment. Bentonite and guar gum are listed as 'E' category fluids under the OCNS and is included on the Oslo Paris (OSPAR) Commission PLONOR (chemicals that 'pose little or no risk to the environment') list (OSPAR Commission, 2019). WBMs can be discharged to sea as fluids retained on cuttings and as bulk discharge from mud pits.
  - Non-water based muds (NWBMs) refers to drill fluids that are hydrocarbon rather than water based fluid. NWBM may contain a range of synthetic hydrocarbons, such as paraffins and olefins; however, such additives are designed to be low in toxicity and biodegradable, as well as not being readily bioavailable or likely to bioaccumulate, particularly in deeper water areas. No bulk discharge of NWBMs will occur offshore, only NWBMs retained on cuttings can be discharged from the MODU. If a NWBM system is required to drill a well section, the cuttings from the NWBM drilling fluid system will pass through the SCE (centrifuge and dryers) to reduce the average residual oil on cuttings (OOC). An OOC discharge limit of 6.9% wt/wt or less on wet cuttings will be averaged over well sections drilled with NWBM for the well. It is noted that microbial biodegradation can result in oxygen reduction within sediments, however Nedwed et al. (2006) found that depth is an important factor for residual concentrations of NWBF once they reach the seabed, suggesting that loss of base fluid during settling acted to significantly reduce chemical effects from discharges. It is also noted that NWBM cuttings tend to clump and settle to the seabed rapidly adding to the cuttings pile in proximity to the well site.

Drill cuttings and unrecoverable WBMs are discharged at the seabed at each well site for the top-hole sections, which are drilled riserless (i.e. no closed loop with the MODU). This results in a localised area of sediment deposition (known as a cuttings pile) around and in proximity to the well site influenced by prevailing seabed currents.

Once the top-hole sections are complete, installation of the riser and BOP provides a conduit back to the MODU, forming a closed circulating system. The bottom hole sections will be drilled with a marine riser in place that enables cuttings and drilling fluids to be circulated back to the MODU, where the cuttings are separated from the drilling fluids by the solids control equipment (SCE) and typically re-used in the closed loop system between the well bore and the MODU. The cuttings (with adhered residual fluids) are, in typical circumstances, discharged below the water line, with their fate and dispersion determined by cuttings particle size and the density of the unrecoverable fluids. In contrast the fluids are recirculated into the fluid system where there are a number of mud pits (tanks) on the MODU that provide a capacity to mix, maintain and store fluids required for drilling activities. The mud pits form part of the drilling fluid circulating system and may be discharged at the end of specific well sections, where there is a requirement to change the drilling fluid system or the drilling fluid cannot be re-used (due to deterioration/contamination). Bulk discharge of this type is only permitted for WBMs.

For the purposes of this impact assessment, the indicative dimensions, discharge locations and approximate drill cuttings and drilling fluid volumes provided in **Table** represent the worst case for a single section, taking into account each well to be drilled during the Petroleum Activities Program.

**Table 6-8: Indicative drill cuttings and fluid volumes for an example Scarborough development well**

| Well Section | Discharge Point | Drilling Fluid Type | Approx. Interval Length (m) | Approx. Cuttings Volume Discharged ($m^3$) | Approx. Fluid Volume ($m^3$) |
|---|---|---|---|---|---|
| 42″ Conductor Hole | Seabed | Seawater (SW) / pre-hydrated | 72 | 65 | 880 |

| | | | | | |
|---|---|---|---|---|---|
| | | bentonite sweeps (PHB) | | | |
| 26″ Surface Hole | Seabed | SW / PHB / WBM / PAD | 744 | 255 | 2800** |
| 17½″ Hole | Surface (-1 m MSL) | WBM | 396 | 62 | 1450 |
| 12¼″ Hole | Surface (-1 m MSL) | WBM | 573 | 44 | 1020 |
| 8½″ x 9 7/8″ Open Hole | Surface (-1 m MSL) | WBM | 336 | 17 | 970 |
| **Total per well** | | | | **443** | **7120** |
| *Contingency Side Track* | | | | *121* | *2000* |

*** Includes drilling 60 m with PAD*

*MSL – metres below sea below.*

*Not all fluid will be discharged after each section – options for reuse during batch drilling will be explored*

***Subsea – Displacement, Completion and Well-bore Cleanout Fluids***

Completion fluids are usually brines (i.e. a mixture of seawater or formation water) with additives that can include:

- chlorides (often sodium, potassium or calcium)
- bromides
- hydrate inhibitor (MEG)
- biocide
- oxygen scavenger.

They are designed to have the proper density and flow characteristics to be compatible with the reservoir formation. Completion fluids are used to run well completions, and during wellbore clean up and flowback during drilling.

Wellbore and casing clean-up are required at various stages of the drilling operations to ensure the contents of the well are free of contaminants before the next stage of drilling. A chemical wellbore cleanout fluid train may be used to remove residual fluids (including NWBM, if used) from the wellbore. The wellbore cleanout fluid is usually brine (similar to completion fluid) that can include several chemicals, such as biocide and surfactant. During the clean-up process, fluids are circulated back to the MODU.

Cleanout fluids and completion brine will be captured and stored on the MODU and discharged if oil concentration is less than 1% by volume or returned to shore if discharge requirements cannot be met. Discharge volume would be ~400 $m^3$.

***Contingent Drilling Activities***

Respud

It is unlikely that a well would be required to respud. If required, the most likely scenario is that the decision to respud is made during drilling of the top hole section of a well; therefore, the incremental increase in cuttings and fluids discharges is associated with the repeat drilling of the same top hole sections for the respudded well with the same associated discharges. A respud once drilling of the bottom hole sections has commenced is far less likely, given the time and effort already committed to the well. However, if this was to occur, the associated discharges would also be a repeat of the discharges as per **Table** to re-drill the same sections of the respudded well.

Sidetrack

The option of a sidetrack instead of a respud may be determined, if operational issues are encountered. Should a sidetrack be required, it will result in an increase in the volume of cuttings generated and a potential increase in the use of NWBM. Additional drill cuttings volumes are estimated in **Table** .

Well Annular Fluids

Well annular fluids refer to the fluids that remain in the wellbore, or annular spaces between the casing. It may consist of weighted drilling fluid and cement-contaminated mud, seawater, barite, cement polymer, and may include small amounts of hydrocarbon.

If a well is underperforming, or surveillance indicates debris is contained within the well, the contents of the wellbore may be flowed to a MODU. This displaces the well fluids (i.e. suspension/completion fluids). These are discharged overboard, as potential gas content makes it too dangerous to personnel to filter or treat them.

In the event a wellhead is removed due to the requirement to respud, small volumes (~1.5 $m^3$) of fluid exchange between the annular spaces and the ocean may occur. The exchange will not be instantaneous as the annular spaces

are small and the fluids are typically heavier than seawater. In the unlikely event routine wellhead removal techniques are unsuccessful, this fluid exchange is expected to occur over time following sufficient corrosion of the wellhead.

The small volumes and non-instantaneous nature of the release of the well annular fluids is expected to result in rapid dilution to a no-effect concentration within metres of the release location.

## Detailed Impact Assessment

### *Assessment of Potential Impacts*

Routine and non-routine drilling-related discharges may result in the following impacts:

- change in water quality
- change in seabed sediment quality
- change in seabed habitat
- injury/mortality to marine fauna (benthic communities).

Some fluids are discharged at the sea surface (or just below); and some are discharged at the seabed. Due to water depth in the PAA (900–955 m), this will determine the exposure pathway, and hence potential impacts and receptors.

***Drill Cuttings and Retained Fluids***

*Water Quality and Planktonic Communities*

Drill cuttings and retained drilling fluid discharges are expected to increase turbidity and TSS levels above ambient concentrations above the seabed (top-hole well sections) or in the upper surface layers (bottom-hole well sections with discharge below the water line from the MODU). Drill cuttings discharge will be generally intermittent and of short duration (over a total period of about 60 days per well) during the drilling of a well.

Top-hole well section drill cuttings and drilling fluids (WBM) will be discharged at the seabed. The coarser material (drill cuttings) will deposit on the seabed and the finer sediment material (the WBM) will cause localised elevated TSS in the water column above the seabed surrounding the well. This reduction in water quality will be temporary (limited to the operational discharges during drilling) and subject to rapid dispersion and dilution by prevailing seabed currents.

During bottom-hole well sections, when drill cuttings with retained drilling fluids (WBM or NWBM) are discharged below the water line (from the MODU), the larger particles, representing about 90% of the mass of the solids, form a plume that drops out of suspension in the water column rapidly and, deposits on the seabed. About 10% of the mass of the solids (the fines predominately composed of drilling fluid) form a plume in the upper surface layer (depending on the depth of discharge from the MODU) that will be transported by prevailing currents away from the MODU and is diluted rapidly in the receiving waters (Neff 2005, 2010). There is a large body of knowledge indicating a discharge of cuttings with adhered fluids diluting rapidly. These studies have found that within 100 m of the discharge point, a drilling cuttings and fluid plume released at the surface will have diluted by a factor of at least 10,000. Further to that, Neff (2005) states that in well mixed oceans waters, the plume is diluted by more than 100-fold within 10 m of the discharge site.

Dispersion of the cuttings plume is influenced by a number of factors: particle sized distribution of the cuttings and fluids, operational discharge events and rates and metocean conditions such as ocean current speed. The case studies described in Neff (2005) used WBMs and surface current speeds of 0.15–0.3 m/s. As currents in the PAA are ~0.25 m/s at the surface, and WBMs (bulk discharge) will contribute the largest input to elevated TSS/turbidity during drilling discharges, the dispersion extent as determined by Neff (2005) is considered representative for the Scarborough drilling program.

Using the widely-accepted dilution factor of 10,000 (Neff, 2005), cuttings (and adhered fluids) are expected to reach 100 mg/L TSS within 100 m of the MODU. Using a conservative ocean current speed of 0.1 m/s (which is below average current speeds in the PAA), these discharges are expected to disperse to 100 mg/L within ~16 minutes.

Given the generally low concentration of TSS outside the immediate vicinity of the discharge point, due to rapid dispersion of sediment and the short period of intermittent discharge, the plume is not expected to have more than a very highly localised reduction in water quality and area of potential ecological impact. It is not predicted to impact productivity of the water column.

The combination of low toxicity and rapid dilution of unrecoverable NWBMs discharged in association with drill cuttings are of little risk of direct toxicity to water-column biota (Neff et al., 2000).

Injury/mortality to planktonic species may occur due to a change in water quality following discharges of drill cuttings and fluids. Impacts to these organisms can be as a product of both physical and chemical alterations of water quality, predominantly in the water column.

As outlined above, using the widely-accepted dilution factor of 10,000 (Neff, 2005), cuttings (and adhered fluids) are expected to reach 100 mg/L TSS within 100 m of the MODU over a period of ~16 minutes. Minimal impact to plankton (phytoplankton, zooplankton and meroplankton (larvae of invertebrates and fish) is therefore expected from the discharge of drill cuttings. Neff (2010) explains that the lack of toxicity and low bioaccumulation potential of the drilling muds means that the effects of the discharges are highly localised and are not expected to spread through the food web (of which planktonic species are the basis).

Impacts to zooplankton from turbidity are associated with variations in predator prey dynamics, which favours planktonic feeders over visual feeders (Gophen, 2015), while impacts to phytoplankton occur due to decreases in available light, therefore reducing productivity (Dokulil, 1994). Surveys completed by ERM (2013) during the wet and dry season within the Exmouth Plateau in the vicinity of the PAA found that there is generally very low planktonic productivity in the region, with areas of periodic upwelling that induce greater productivity.

Jenkins and McKinnon (2006) reported that levels of suspended sediments greater than 500 mg/L are likely to produce a measurable impact upon larvae of most fish species, and that levels of 100 mg/L will affect the larvae of some species if exposed for periods greater than 96 hours. Jenkins and McKinnon (2006) also indicated that levels of 100 mg/L may affect the larvae of several marine invertebrate species, and that fish eggs and larvae are more vulnerable to suspended sediments than older life stages. However, dilution estimates (e.g. Hinwood et al., 1994; Neff, 2005) suggest suspended sediment concentrations caused by the discharge of drill cuttings will be well below the levels required to cause an effect on fish or invertebrate larvae (i.e. predicted levels are well below a 96-hour exposure at 100 mg/L, or instantaneous 500 mg/L exposure), beyond the immediate vicinity of the discharge.

Due to the low levels of planktonic productivity in the offshore area, plankton populations on a regional scale are not expected to be affected by drilling operations. In addition, due to the open nature of the marine environment of the PAA and associated environmental conditions (i.e. windy, strong currents, etc.), the content and dispersive nature of drilling muds within the marine environment and the high population replenishment of these organisms, it is expected that impacts to plankton species will be limited to within tens of metres of the discharge point and return to previous conditions within a relatively short period of time. On this basis, the impacts to plankton from routine and non-routine discharges during drilling activities is slight.

*Sediment Quality and Benthic Communities*

Accumulation of drill cuttings on the seabed causes changes in the physical properties of the seabed sediment such as the particle size distribution (PSD), the introduction of contaminants (metals such as barium) from retained drilling fluids (WBM), introduction of forms of petroleum hydrocarbons (from retained NWBM on cuttings) and associated ecological effects.

The discharge of drill cuttings and unrecoverable fluids at the seabed during riserless top hole drilling results in a localised area of sediment deposition (known as a cuttings pile) surrounding the well site. The cuttings pile distribution may reflect prevailing seabed currents and spread predominately downstream of the well site but overall extent from the well site is typically tens of metres. The dimensions of the cuttings pile depend on several factors, including volume (approximately 320 $m^3$ of top hole cuttings per well; **Table** ) and composition of cuttings, and oceanographic conditions at the discharge location. The top-hole well section drill cuttings and retained drilling fluids (WBM) to seabed have the greatest impact to sediment quality and modification of the habitat in proximity to the well, as the solids tend to clump and settle rapidly around the discharge point (Neff, 2010).

Indicative components of the WBM system outlined in **Section 3.8.1.6** have a low toxicity. Bentonite and chemicals from the family of XC polymers (Xanthan Gum or similar) are listed as 'E' category fluids under the OCNS and considered to 'pose little or no risk to the environment'. Metals such as barium from these additives will be present in the drilling fluid, primarily as insoluble mineralised salts, and consequently are not released in significant amounts to the pore water of marine sediments and have low bioavailability to those benthic fauna which may come into contact with the discharged barite (Crecelius et al., 2007; Neff, 2008). The XC polymer and bentonite sweeps have very low toxicities and are considered by OSPAR to pose little or no risk to the environment.

As described above, the bottom hole sections are drilled after the riser is fitted. Cuttings and unrecoverable fluids are discharged below the water line at the MODU site, resulting in drill cuttings and retained drilling fluids rapidly dispersing through the water column. The larger cuttings particles will drop out of suspension and deposit in proximity to the well site (tens to hundreds of metres distance) with potential for localised spreading downstream, while the finer fluid particles will remain in suspension and will be transported further away from the well site, rapidly diluting and eventually depositing over a larger area (hundreds of metres to several kilometres) downstream of the well site. Drill cuttings from the bottom-hole sections will be smaller in volume (approximately 122 $m^3$ per well; **Table** ) and as determined by surface discharge, depth of seabed and time to reach seabed, result in an extended area of deposition, but a much thinner cuttings pile depth (IOGP, 2016). The fines associated with the retained drilling fluids or mud pit bulk discharge of WBM will settle over a greater extended distance as a thin, undetectable veneer on the seabed. Predicted impacts for bottom hole cuttings are generally confined to a maximum of 500 m from the discharge point (IOGP, 2016). However, when discharged in deeper waters (>400 m), WBM/NWBM cuttings may be deposited over a much larger area, to a horizontal distance of 500–1000 m from the discharge site (with concentrations decreasing with increasing distance) (IOGP, 2016). The final deposition of drill cuttings and drilling fluids is largely determined by seabed depth and the time to drop out of suspension within the water column and deposit on the seabed. This leads to the coarser cuttings material being deposited at a location offset but closest to the well site in an area downstream and a distance up to of several hundreds of metres, with associated ecological effects within this area and the fines (predominately drilling fluids) dispersed over a greater distance from the discharge site, typically several kilometres but with no associated ecological effects.

Base fluids for NWBM are assessed in accordance with Woodside's Chemical Selection and Assessment Environment Guideline. They are designed to be biodegradable in offshore marine sediments. Biodegradation can result in a low oxygen (anoxic) environment resulting in changes in benthic community structure. Species sensitive to

anoxic environments are eliminated and replaced by tolerant and opportunistic species, resulting in decreased species diversity, but the number of individuals often increases (Neff et al., 2000). NWBMs are designed to be low in toxicity and are not readily bioavailable to benthic fauna due to their physical/chemical properties. Nedwed et al. (2006) found that depth is an important factor for concentrations of NWBM on cuttings, where cuttings which had a great distance to reach the seabed (950 m) had significantly lower concentrations, suggesting that loss of base fluid during settling acted to significantly reduce chemical effects from discharges. The study concluded that NWBM discharged in deep water posed very limited environmental impacts (from analysis of difference in benthic fauna between pre- and post-drilling samples, Nedwed et al., 2006). This discharge is expected to dilute rapidly, with a potential impact to the environment considered to be a local, temporary decrease in water quality (as discussed above).

Benthic organisms below the cuttings pile will be buried and smothered; however, the cuttings piles are expected to be recolonised over time. Ecological impacts to benthic biota are predicted when sediment deposition is equal to or greater than 6.5 mm in thickness (IOGP, 2016). This amount of sediment deposition from top hole and bottom hole cuttings is expected to be confined to within a few hundred metres around the well location, although this depends on the nature of the cuttings, the water depth and currents of the receiving environment (IOGP, 2016). A conservative radius of 500 m representing a zone of potential ecological impact has been applied to each well location for this impact assessment. Mobile benthic fauna, such as demersal fish, may be temporarily displaced from areas where cuttings discharges accumulate. Furthermore, ecological impacts are not expected for mobile benthic fauna such as crabs and shrimps or pelagic and demersal fish, given their mobility (IOGP, 2016). Balcom et al., (2012) concluded that impacts associated with discharging cuttings and base fluids (including NWBMs) are minimal, with impacts highly localised to the area of the discharge deposition on the seabed. Changes to benthic communities are normally not severe. Organic enrichment can occur, leading to anoxic conditions in the surface sediments and a loss of infauna species that have a low tolerance to low oxygen concentrations, and to a lesser extent chemical toxicity near the well location. These impacts are highly localised with short-term recovery that may include changes in community composition with the replacement of infauna species that are hypoxia-tolerant (IOGP, 2016). Recovery of affected benthic infauna, epifauna and demersal communities is expected to occur, given the short duration of sediment deposition and the widely represented benthic and demersal community composition. The zone of potential ecological impact for each well is conservatively estimated to be 0.8 $km^2$ and the total area of potential ecological impact for the ten wells (two of which are contingency) is conservatively estimated to be 8 $km^2$.

It is acknowledged that transport of fines (associated with the drilling fluids) will disperse beyond the zone of potential ecological impact but there are no associated ecological effects expected beyond this zone (500 m distance from the well sites). Low levels of sediment deposition away from the immediate area of the well site would represent a thin layer of settled drill cuttings and drilling fluids, which will likely be naturally reworked into surface sediment layers through bioturbation (US Environmental Protection Agency, 2000). Metals such as barium from the drilling fluid additives are used as a tracer of dispersion and are typically detected beyond the zone of ecological impact but as discussed for sediment quality (above), the insoluble mineralised salts (the source of barium) have low bioavailability to benthic biota.

Impacts associated with routine and non-routine drilling discharges will be largely limited to an area surrounding the well locations, which are in 900–955 m water depth, in the offshore, open water environment and >215 km from the nearest shore. The low sensitivity of the benthic communities/habitats within and in the vicinity of the PAA, combined with the low toxicity of WBMs and residual NWBMs, no bulk discharges of NWBM and the highly localised nature and scale of predicted physical impacts to seabed biota, affirm that any predicted impact is considered likely but of a minor environmental consequence.

*KEFs*

Potential impacts to the Exmouth Plateau KEF, which overlaps the PAA, relate to ecological impacts to the seabed habitat and benthic communities. As described above, the sediment deposition from the discharge of drill cuttings and drilling fluids will be highly localised around each well location. Within the conservatively applied zone of potential ecological impact (500 m radius per well) epifauna and infauna will be buried or smothered, particularly, in close proximity to the wellheads. Mobile epifauna and demersal fish are more likely to be displaced from the zone of potential ecological impact. Recovery of affected benthic infauna, epifauna and demersal fish communities is expected to occur, given the short duration of sediment deposition and the widely represented benthic and demersal community composition. The total percentage area of the Exmouth Plateau seabed habitat and benthic communities affected is conservatively estimated to be 0.01%. The extremely small portion of the overall KEF area predicted to be impacted in combination with the predicted recovery of the affected benthic communities, affirms that any predicted impact is considered likely but of a slight environmental consequence.

***Drilling Fluids (Bulk Discharge)***

WBM may be bulk discharged at the end of specific well sections, as described above, where there is a requirement to change the drilling fluid system or the drilling fluid cannot be re-used (due to deterioration/contamination). A small quantity of WBM and NWBM residue (<1%) may also be discharged at the sea surface while cleaning the mud pits, typically at the conclusion of drilling activities or when changing between mud types.

Discharge of WBM will result in a buoyant plume of fine materials that will rapidly dilute and decrease in turbidity levels immediately away from the discharge point. WBM samples collected by Jones et al. (2021) from the mud pits

just before discharge during the Greater Western Flank-2 drilling campaign were ~90% silt sized (<62.5 µm) with a mean diameter of 12 µm (gel-polymer) and 33 µm (KCl-polymer). Total suspended solid (TSS) levels in the gel-polymer mud and KCl-polymer mud were 257 g/L and 245 g/L respectively. Jones et al. (2021) used an ROV to observe mud pit discharges and reported the discharge to exit the discharge outlet as a jet of material in a distinctive cloud-like plume descending rapidly to the seabed and growing in diameter with increasing depth.

The subsea plume can be expected to disperse over a wide area (up to several kilometres), with no discernible sediment deposition on the seabed and no physical or biological impacts, particularly given the water depth of the PAA (900–955 m). Impacts beyond the 500 m zone of ecological impact for each well as described for drill cuttings and retained fluids discharge is not expected.

***Subsea – Displacement, Completion and Well-bore Cleanout Fluids***

Discharges such as displacement, completion and wellbore cleanout fluids are typically inert and of low-toxicity. These fluids are mostly brine, with a small proportion of chemical additives such as surfactants, biocide, corrosion inhibitor, oxygen scavenger, MEG and guar gum. The volume of one wellbore and subsequent discharge volume would be ~400 $m^3$. Any change to water quality is expected to be localised and temporary. As this is an intermittent batch discharge, any change in water quality will be short term as discharges are discrete and of short duration. Rapid dilution due to prevailing ocean currents in the open water environment would lead to any changes in water quality such as low toxicity contaminants being temporary (only for the duration of the discharge) and reducing water quality within a short distance of the discharge location.

***Cumulative Impacts***

Given the Petroleum Activities Program includes the drilling of up to 10 development wells, there is the potential for cumulative disturbance to marine sediment quality and benthic communities to occur. The cuttings and drilling fluids discharged from each of the wells will accumulate within the receiving environment. Given that the distances between some of the proposed wells are within 100 m, overlap may occur. When considering deposition of sediments from each drilling activity, deposition at a thickness of greater than 6.5 mm is limited to within a distance of a few hundred metres, although this is dependent on the nature of the cuttings, and the water depth and currents of the receiving environment (IOGP, 2016). If the area of drill cuttings and drilling fluids deposition from the wells overlap, impacts are anticipated to be minimal, considering the observed limited benthic biota within the PAA.

No cumulative impacts to water quality are expected to occur since discharged sediments are predicted to settle in between the drilling activities for each well and no concurrent drilling will occur.

***Summary of Assessment Outcomes***

| Receptor | Impact | Receptor Sensitivity Level | Magnitude | Impact Significance Level |
|---|---|---|---|---|
| Sediment Quality | Change in sediment quality | Low value (open water) | Minor | Slight (E) |
| Water Quality | Change in water quality | Low value (open water) | Slight | Negligible (F) |
| Plankton | Injury/ mortality to fauna | Low value (open water) | Slight | Negligible (F) |
| Epifauna and Infauna | Injury/ mortality to fauna | Low value | Minor | Slight (E) |
| KEFs | Change in habitat | High value habitat | Slight | Minor (D) |

***Overall Impact Significance Level:*** The overall impact significance level for routine and non-routine drilling discharges is D based on slight impact to the high value receptors (KEFs). Further review on the potential recovery time of sediment quality and epifauna/Infauna receptors has increased the significance level from the OPP, but the overall impact significance level (D) is consistent with the level in the OPP.

**Demonstration of ALARP**

| *Control Considered* | *Control Feasibility (F) and Cost/Sacrifice (CS)* | *Benefit in Impact/Risk Reduction* | *Proportionality* | *Control Adopted* |
|---|---|---|---|---|
| ***Legislation, Codes and Standards*** | | | | |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Sampling/analysis of stock barite to ensure acceptable levels of heavy metals (Cadmium and Mercury). | F: Yes.<br>CS: Minimal cost. Standard practice. | Ensures heavy metal concentrations in stock barite are at acceptable levels to reduce the consequence of discharges to the marine environment. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.14** |
| | | ***Good Practice*** | | |
| Drilling and completions fluids will have an environmental assessment completed prior to use. | F: Yes.<br>CS: Minimal cost. Standard practice. | Environmental assessment of chemicals will reduce the consequence of impacts resulting from discharges to the marine environment by ensuring chemicals have been assessed for environmental acceptability. Planned discharges are required for the safe execution of activities and therefore no reduction in likelihood can occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.1** |
| For drilling and completion fluids, periodic chemical reviews are performed. | F: Yes.<br>CS: Minimal cost. Standard practice. | Regular reviews will ensure chemicals selected for drilling and completions fluids remain ALARP. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.2** |
| Written NWBM justification process followed. | F: Yes.<br>CS: Minimal cost. Standard practice. | The written justification takes onboard the technical need for NWBM use, receiving environment, cost and additional controls that may be required. By undertaking formal assessment, the potential impacts are well understood allowing for development of control measures to reduce the consequence of NWBM use. This provides an overall environmental benefit. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.3** |
| NWBM base oils selected based on expected toxicity. | F: Yes.<br>CS: Minimal cost. | By selecting a base oil with lower toxicity, the consequence of the release on the environment is reduced. | Benefits outweigh cost/sacrifice | Yes<br>**C 7.4** |
| Backload bulk NWBM or maintain on rig for re-use | F: Yes.<br>CS: Minimal cost. Standard practice. | By restricting the volume of NWBM for overboard discharge, the consequence of the release on the environment is reduced. Although no change in likelihood is provided, the decrease in consequence results in an environmental benefit. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.5** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Bulk operational discharges conducted under MODU's Permit to Work (PTW) system (to operate discharge valves/pumps). | F: Yes.<br>CS: Minimal cost. Standard practice. | The MODU's PTW may slightly reduce the volumes of bulk discharges occurring, but it is unlikely to be significant given that bulk discharges are often operationally required and cannot be eliminated. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.6** |
| Displacement, brine, workover or intervention fluids contaminated with hydrocarbons will be treated prior to discharge or contained.<br>If discharge specification not met the fluid will be returned to shore. | F: Yes.<br>CS: Minimal cost. Standard practice. | Ensuring <1% oil content will provide a small reduction in consequence when fluids are discharged to the environment. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.7** |
| SCE used to treat NWBM cuttings prior to discharge. | F: Yes.<br>CS: Minimal – more frequent cuttings sampling and testing. | Achieving average oil on cuttings (sections using NWBM only) discharge limit of 6.9% or less oil on wet cuttings will have a small reduction in consequence. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.9** |
| In event of SCE failure (including auger) while drilling with NWBM, the initial action will be to cease drilling and determine whether to repair SCE or drill ahead until next practicable opportunity to trip out of the hole.<br>If cuttings are discharged during dryer or auger failure, measurement of OOC to occur more frequently from shakers. | F: Yes.<br>CS: Cost and schedule implications due to cessation of drilling. | Ceasing of drilling in the event of equipment failure will allow for time to assess feasibility of drilling ahead while still meeting residual OOC discharge requirements. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.10** |
| ***Professional Judgement – Eliminate*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| Mud pit wash residue will be measured for oil content prior to discharge. | F: Yes.<br>CS: Minimal cost. Standard practice. | Ensuring <1% oil content will provide a small reduction in consequence when residue is discharged to the environment. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.11** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| WBM drill cuttings returned to the MODU will be processed using SCE equipment. | F: Yes.<br>CS: Minimal cost. Standard practice. | Limiting the discharge of WBMs through reuse will reduce the consequence of the using WBM. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.12** |
| Drill cuttings returned to the MODU will be discharged below the water line. | F: Yes.<br>CS: Minimal cost. Standard practice. | Discharge of drill cuttings below the water line will reduce carriage and dispersion of cuttings thereby reducing the consequence of cuttings discharges during the Petroleum Activities Programme. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.13** |
| Cuttings reinjection into formation. Cuttings are crushed, slurrified and pumped to a desired geological structure with a suitable seal, below the seabed through an annulus or tubing. | F: No.<br>No concurrent drilling or direct sequential drilling planned which would require cuttings to be stored prior to re-injection.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| Riserless Mud Recovery (RMR) system to return top-hole cuttings/mud from the riserless section of the well to the MODU prior to treatment onboard and discharge from the MODU (below the water line) for all wells. | F: Not technically feasible due to water depth.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| Riserless Mud Recovery (RMR) system to return top hole cuttings from the riserless section of the well to the MODU prior to transport to an alternative discharge location or back to shore for disposal. | F: Not technically feasible due to water depth.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| Return riser-in-place cuttings for disposal at another marine location or onshore for processing and land disposal (skip and ship) for whole well to reduce risk of benthic disturbance.<br>OR<br>Return riser-in-place cuttings for all sections | F: Yes.<br>CS: Primary cost/sacrifice of this option is the additional handling required in transporting cuttings to alternative disposal location. Particularly the health and safety risks associated with high frequency of | Compared to adopted control, return riser in place cuttings would achieve a reduction in cuttings/mud discharged (although discharge would still occur during riserless drilling on the basis this control is not adopted) at each well location; however, given current impact assessment and controls adopted, this would not result | Disproportionate. Given the adopted controls and low current risk rating, the high cost/sacrifice outweighs the benefit gained over the duration of the Petroleum | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| drilled with NWBM for disposal onshore (to reduce potential residual oil on cuttings to environment). | support vessel activity alongside the rig and the amount of crane lifting required if a cuttings skip/drilling waste container system were employed.<br>Other cost/sacrifice elements which are considered include:<br>• Further treatment of cuttings onshore is required to ensure a standard suitable for landfill. Class II disposed locally (e.g. Karratha). Class III landfill requires transport to Geraldton or Perth<br>• Increased risk of unplanned vessel collision or loss of cuttings during transfer activities<br>• Environmental impact (suspended sediment/sedimentation) of discharging cuttings at new location and other regulatory approvals may also be required (e.g. sea dumping permit).<br>• Potential halt to drilling activity if transfer operations are delayed due to weather or operational issues<br>• Additional environmental impact incurred (air emissions) from vessel use | in a significant reduction on consequence. | Activities Program.<br>Impact assessment has determined no sensitive benthic receptors in the vicinity and a low level of impact potential from overall cuttings/mud discharge therefore benefit to be gained from cuttings/mud recovery is disproportionate to the risks introduced by cuttings relocation (including if an alternative system which doesn't use transport containers was implemented). | |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | and onshore trucking for transportation of cuttings.<br>Disposal via landfill and/or treatment does not eliminate an environmental impact. These options have their own impacts and therefore disadvantages if implemented. | | | |
| Reduce total drill cuttings by implementing slim well design. | F: No. Slim well design is not considered feasible based on the following factors:<br>• The well design is optimised to minimise the size of hole drilled while still being able to reach the targets and meet development objectives safely.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| Water quality and/or sediment monitoring of drill cuttings or drilling fluids to verify impact during activity. | F: Yes.<br>CS:<br>• For in-water sampling utilising ROV - Time and logistics for tool change out from operational tools to specialised scientific sampling tools.<br>• Additional personnel on board to operate ROV and coordinate sampling program.<br>• Low ROV availability due to operations can limit time to perform environment monitoring. | No environmental benefit would be gained by implementation of monitoring during the activity. Monitoring could be used to inform additional control measures in future drilling activities; however, there is a considerable body of existing scientific literature on potential impacts of drill cuttings and impacts are generally well understood. Furthermore, it is not guaranteed that additional controls would be feasible, or if they would provide any environmental benefit. | Disproportionate<br>Cost/sacrifice outweigh benefit to be gained in the context of existing environment (deep water, open ocean communities with no proximity to sensitive benthic communities or receptors).<br>Although adoption of this control could be used to verify EPOs associated with drilling mud and cutting discharge, alternative controls identified | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | • If additional ROV is required on the MODU, deck space and resources to run/store/service ROV.<br>• Resources for sample processing (space/ equipment/ personnel). | | achieve an appropriate outcome. | |
| Use SCE with secondary treatment for NWBM: Thermomechanical systems (to achieve <1% average oil on cuttings). | F: Yes – with associated infrastructure including vessels for offline storage and delivery to thermomechanical dryer.<br>CS: The primary cost/sacrifice of this option is the monetary outlay for acquisition and implementation which is estimated at $800,000 to mobilise, install and demobilise, along with a running cost of about $32,000/day.<br>Other factors considered include:<br>• It is estimated that it would take a minimum of seven months to mobilise, install and commission the system on to the MODU.<br>• Complex and unfamiliar system to integrate with the rig systems.<br>• Increased health and safety exposure due to:<br>– crew of nine engineers and technicians required to run the plant. | A reduction in consequence would be achieved by reducing the average oil on cuttings discharged. | Disproportionate.<br>Cost/sacrifice outweighs benefit to be gained in the context of existing environment and drilling campaign as the use of NWBM is a contingent activity and is not planned. | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | – multiple crane lifting operations, during installation, operations and demobilisation.<br>– rotating machinery<br>– heat illness<br>– deck congestion due to large footprint of the plant. | | | |
| Time restricted discharge of WBM and/or cuttings to align with tide/current or other oceanographic events. | F: Yes.<br>CS: Disruption to drilling operations in having to stop drilling at time when discharge of WBM and/or cuttings might not be permitted.<br>Additional mud storage volume required. | Given the offshore location, oceanographic changes are unlikely to significantly affect the dispersion of cuttings and therefore no environmental benefit would be gained. | Disproportionate. The cost/sacrifice outweighs the benefit gained – No hard coral or other photo-sensitive benthic communities in the vicinity of wells to rationalise phased/ timed discharge. | No |

**ALARP Statement:**

On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the impacts of drill cuttings and drilling fluids (WBM and NWBM). As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.1.13.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall impact significance levels for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to routine drilling discharges have been adopted.<br>• There are no changes to internal context specific to this risk from the OPP.<br>• Potential impacts from drill cuttings and drilling fluids was raised during consultation (**Appendix F, Table 1**) and this feedback was considered in the finalisation of the EP. |
| ***Acceptability Statement:*** |

| Demonstration of Acceptability |
|---|
| The impact assessment has determined that, given the adopted controls, routine and non-routine drilling discharges are unlikely to result in an impact greater than minor. Further opportunities to reduce the impacts have been investigated above.<br>The adopted controls are considered good oil-field practice/industry good practice to prevent the generation of significant volumes of drill cuttings and to manage the discharge of drill cuttings and fluids. The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of these discharges to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 1**<br>Undertake Petroleum Activities Program in a manner that does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results.<br>**EPO 11**<br>Undertake Petroleum Activities Program in a manner that does not result in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health.<br>**EPO 12**<br>Undertake Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of plankton including its life cycle and spatial distribution.<br>**EPO 13**<br>Undertake Petroleum Activities Program in a manner that will not | **C 7.1**<br>Drilling and completions fluids will have an environmental assessment completed prior to use. | **PS 7.1**<br>All chemicals intended or likely to be discharged into the marine environment reduced to ALARP using the chemical assessment process. | **MC 7.1.1**<br>Records demonstrate chemical selection, assessment and approval process for selected chemicals is followed. |
| | **C 7.2**<br>For drilling and completion fluids, periodic chemical reviews are performed. | **PS 7.2**<br>Acceptability of previously approved chemicals are re-evaluated to ensure ALARP and alternatives are considered. | **MC 7.2.1**<br>Records confirm periodic reviews have taken place, and any actions/changes are being tracked to closure. |
| | **C 7.3**<br>Written NWBM justification process followed. | **PS 7.3**<br>NWBMs only used where written justification process has been followed. | **MC 7.3.1**<br>Records show NWBM justification process has been followed and NWBM only used where technically required. |
| | **C 7.4**<br>NWBM base oils selected based on expected toxicity. | **PS 7.4**<br>Group III base oils used in NWBM. | **MC 7.4.1**<br>Records demonstrate that only Group III base oils used in NWBM. |
| | **C 7.5**<br>Backload bulk NWBM or maintain on rig for re-use | **PS 7.5**<br>No overboard disposal of bulk NWBM | **MC 7.5.1**<br>Incident reports of any unplanned discharges of NWBM |
| | **C 7.6**<br>Bulk operational discharges conducted under MODU's permit to Work (PTW) system (to operate discharge valves/pumps). | **PS 7.6**<br>Increased level of assurance and verification on bulk operational discharges. | **MC 7.6.1**<br>Records demonstrate that bulk discharges are conducted under the MODU PTW system. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in an area defined as a Key Ecological Feature.<br>**EPO 14**<br>Undertake Petroleum Activities Program in a manner that prevents substantial change in sediment quality, which may adversely impact biodiversity, ecological integrity, social amenity or human.<br>**EPO 15**<br>Undertake Petroleum Activities Program in a manner that prevents significant impacts on the values of the Exmouth Plateau KEF. | **C 7.7**<br>Displacement, brine, workover or intervention fluids contaminated with hydrocarbons will be treated prior to discharge or contained.<br>If discharge specification not met the fluid will be returned to shore. | **PS 7.7**<br>Achieve oil concentration <1% by volume prior to discharge. | **MC 7.7.1**<br>Records demonstrate that discharge criteria were met prior to discharge or was taken onshore. |
| | **C 7.9**<br>SCE used to treat NWBM cuttings prior to discharge. | **PS 7.9**<br>Average OOC (sections using NWBM only) discharge limit of 6.9% or less oil on wet cuttings is achieved. | **MC 7.9.1**<br>Records confirm the average OOC for the entire well (sections using NWBM only) do not exceed limit. |
| | **C 7.10**<br>In event of SCE failure (including auger) while drilling with NWBM, the initial action will be to cease drilling and determine whether to repair SCE or drill ahead until next practicable opportunity to trip out of the hole.<br>If cuttings are discharged during dryer or auger failure, measurement of OOC to occur more frequently from shakers | **PS 7.10**<br>The decision whether to repair SCE or drill ahead has considered the estimated time for repairs and the amount of drilling until next planned trip out of hole, to ensure the OOC limit is not exceeded. | **MC 7.10.1**<br>Records demonstrate that in the event of auger or cuttings dryer failure (where no redundancy is available), active drilling is initially stopped as soon as safe to do so. Evidence of assessment to drill ahead with failed SCE can be produced. |
| | **C 7.11**<br>Mud pit wash residue will be measured for oil content prior to discharge. | **PS 7.11**<br>Achieve less than 1% by volume oil content before discharge | **MC 7.11.1**<br>Records after pit clean out (for pits potentially contaminated with base oil) demonstrate mud pit wash residue was less than 1% by volume oil content before discharge. |
| | **C 7.12**<br>WBM drill cuttings that are returned to the MODU will be processed (using SCE equipment). | **PS 7.12**<br>WBM drill cuttings that are returned to the MODU processed using SCE equipment allowing reuse of mud prior to discharge. | **MC 7.12.1**<br>Records demonstrate that operational SCE is in use. |
| | **C 7.13**<br>Drill cuttings returned to the MODU will be discharged below the water line. | **PS 7.13**<br>Cuttings discharged below the water line | **MC 7.13.1**<br>Records confirm cuttings discharge chute/line below the water line. |
| | **C 7.14**<br>Sampling/analysis of stock barite to ensure acceptable | **PS 7.14**<br>Sampling/analysis of stock barite to ensure that heavy | **MC 7.14.1**<br>Records demonstrate that concentrations of heavy |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | levels of heavy metals (Cadmium and Mercury). | metals of concern (cadmium and mercury) are within limits prescribed by API standards:<br>• Mercury (Hg): max 1 mg/kg (<1ppm) dry weight in stock barite<br>• Cadmium (cd): max 3 mg/kg (<3ppm) dry weight in stock barite | metals within stock barite used during the activity are within acceptable levels. |

## 6.7.8 Routine and Non-Routine Discharges: Cement, Cementing Fluids, Subsea Well Fluids, Produced Water and Unused Bulk Product

| **Scarborough OPP – Relevant Impact Assessment Section** | | |
|---|---|---|
| Section 7.1.12 (Routine and Non-Routine Discharges: Drilling) | | |
| **Context** | | |
| **Relevant Activities**<br>Drilling Activities – **Section 3.8**<br>Contingency Activities – **Section 3.10** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2**<br>Habitats and Biological Communities – **Section 4.5**<br>Protected Species – **Section 4.6** | **consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | Environmental Value Potentially Impacted | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Routine discharge of cement and cementing fluids, to the seabed and the marine environment. | | ✓ | ✓ | | ✓ | | | A | D | - | - | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 1, 11, 12, 14, 15 |
| Routine discharge of subsea well fluids (inc. BOP and well construction activity control fluids); completion fluids, produced water and well intervention/ workover fluids. | | ✓ | ✓ | | ✓ | | | A | D | - | - | | | |
| Non-routine discharge of unused bulk products | | ✓ | ✓ | | ✓ | | | A | D | - | - | | | |

**Description of Source of Impact/Risk**

***Cement, Cementing Fluids, Grout, Subsea Well Fluids and Unused Bulk Products***

*Cementing Fluids, Cement and Grout*

Cementing fluids, including cementing mix water, may require discharge to the marine environment under various scenarios.

At the commencement of the drilling campaign there may be a requirement to run a cement unit test to ensure the functionality of the cement unit and the cement bulk delivery system prior to performing an actual cement job. This test would result in a small volume of approximately 10 $m^3$ of cement slurry being discharged at the sea surface. The slurry is usually a mix of cement and water however may contain stabilisers or chemical additives.

When cementing the conductor and surface casings after top hole sections of the well have been drilled, cement must be circulated to the seabed to ensure structural integrity of the well. Excess cement is pumped to ensure structural integrity is achieved. If the hole is completely in-gauge and there are no downhole losses while pumping the cement, a

maximum volume of 80 m³ per well is estimated to be circulated to the seabed at the well location, which forms a thin concrete film on the seabed in close proximity to the well.

Wherever possible, the cement line flush volumes are included in the planned cement jobs. After each cement job, leftover cement slurry in the cement pump unit and the surface lines is flushed and discharged to the sea to prevent clogging of the lines and equipment. This is estimated at about 44 m³ per well (based on up to four cement jobs per well x 11 m³ discharged per job). In the unlikely event a respud event is required it would result in additional cement jobs. Also, in the rare event that the cement products become contaminated, the entire volume (~180 m³ per well) may need to be discharged to sea.

Cement spacers can be used as part of the cementing process, within the well casing, to assist with cleaning of the casing sections prior to cement flow through. The spacers may consist of either seawater or a mixture of seawater and dye. The dye is used to provide a pre-indicator of cement overflow to the seabed surface, to ensure adequate cement height.

Excess cement (dry bulk, after well operations are completed) will either be: used for subsequent wells; provided to the next operator at the end of the drilling program (as it remains on the rig); or if these options are not practicable, discharged to the marine environment as dry bulk or as a slurry. The process that will be followed to determine discharge is the last option is presented in **Figure 6-1**.

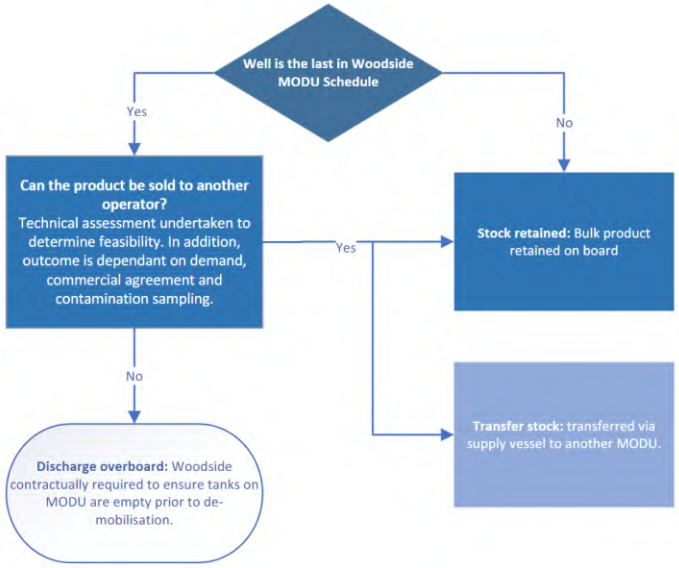


**Figure 6-1: Management process for excess bulk product**

*Subsea Fluids – Blow Out Preventors (BOP) and Well Construction Activity Control Fluids*

Subsea fluids are likely to be released during drilling, completions and xmas tree installation, including the release of BOP control fluids. Subsea control fluids are water-based hydraulic control fluids used in control systems on the subsea trees and BOPs. The BOP is required, by legislation, to be regularly function tested when subsea.

Subsea control fluids will be discharged during:

- installation of the subsea trees (~10 L per well)
- function testing of the subsea tree (~30 L per test)
- function testing of the BOP on installation and pressure testing

The BOP is function tested during assembly and maintenance and during operation on the seabed as described in **Section 3.8.1.3**. As part of this testing, small volumes of BOP control fluid (generally consisting of water mixed with a glycol based detergent or equivalent water-based anti-corrosive additive) are released to the marine environment.

Each time a pressure and function test is undertaken approximately 3620 L of water-based fluid is released to the marine environment, of this approximately 4% is control fluid additive. BOP operation includes function and pressure testing approximately every 21 days, and a function test (approx. 2665 L) approximately every seven days, excluding the week a pressure test is conducted.

Functioning and testing of the subsea xmas trees will result in the discharge of small volumes of water and glycol based control fluid.

*Subsea Fluids – Well Intervention and Workover Fluids*

A workover or intervention may be performed on any wells in the Petroleum Activities Program. If the well has been flowed previously, or if down-hole hydrocarbons remain in the well (e.g. reservoir fluid or if base oil has been left in the well), there is potential that the intervention/workover fluids will be contaminated with hydrocarbons. If hydrocarbon contamination of the intervention/workover fluids has occurred, the fluid will need to be treated on the MODU, to ensure hydrocarbon content prior to discharge, is <1% by volume, or returned to shore if discharge requirements cannot be met.

It may be necessary to remove marine growth from subsea infrastructure using acid (typicallt sulphamic acid) to aid visual inspection and operation of valves and other mechanisms. This will be done using ROV tooling and possibly acid.

*Produced Water*

During well flowback and completion activities, completion fluids and produced water will be discharged to the marine environment via the well test water filtration treatment package. The well test water filtration treatment package will be used to treat produced water that cannot be flared before discharge. Prior to discharge, the fluids are cycled through a water filtration system consistent with solids and polishing. Approximately 100 bbl (16 $m^3$) of produced water may be generated per well, which may be discharged via the well test water treatment package.

Other unused bulk products

Additional products such as barite and bentonite may be discharged in bulk during or at the end of the activity if they cannot be reused or taken back to shore (refer to the process that will be followed to determine discharge is the last option is presented in **Figure 6-1**). Use and discharge of all chemicals and products will be conducted in line with Woodside's internal guidelines (**Section 7.2.1**). Discharge may be in the form of dry bulk or as a slurry; however, discharges will not be contaminated with hydrocarbons. Discharges may be ~75 tonnes of cement, 150 tonnes of barite and 100 tonnes of bentonite. However, these volumes are conservative (50% greater than the minimum required storage volumes) and discharge volumes (if required) are likely to be much smaller.

***Other Contingency Activities***

Well Intervention

At some point in the life of all oil and gas wells, parts may require maintenance, repair or replacement. Well intervention activities generally occur within the wellbore and may include the following activities, as well as any other drilling activities described in **Section 3.8**:

- well logging activities (slickline, wireline, coil tubing)
- well testing and flowback
- well intervention and workovers.

Relevant discharge types generated from these activities may include the following:

- subsea control fluid (control of subsea tree)
- completions fluids
- well annular fluids.

These discharges are not expected to be different from those described above under the associated headings.

Well annular fluids may also be discharged during well intervention.

Kill-weight brine may also be used during well suspension or well abandonment, which is a brine (e.g. sodium chloride) of adequate density to control formation pressure.

## Detailed Impact Assessment

***Assessment of Potential Impacts***

Benthic habitats and communities in the PAA are considered to be of low sensitivity and reflective of the wider NWMR. No known regionally significant benthic or infauna habitat occur in the area. The Exmouth Plateau KEF overlaps the PAA, (**Section 4.7**), however the impacts to values and sensitivities of this KEF are not expected due to the highly localised and small physical footprint of the discharges, coupled with the low toxicity of cementing fluids used for the PAA. The likelihood of any significant impact to marine biota is subsequently considered to be low.

***Cementing Fluids, Cement and Grout***

Impacts of cement on the marine environment are predominantly associated with localised burial of benthic biota in the direct physical footprint of deposition. Cement operations during drilling involve routine and non-routine discharges that can result in turbidity in the water column. Reduction in water quality will be temporary (limited to the cement operational discharges during drilling) and subject to rapid dispersion and dilution by prevailing currents. Modelling of cement discharges for another offshore project (BP Azerbaijan, 2013) was used because it provides an appropriate, but conservative, comparison of the potential extent of exposure from this activity. In this study, two hours after the start of discharge, plume concentrations were determined to be between 5 and 50 ppm with the horizontal and vertical

extents of the plume ~150 m and 10 m, respectively (BP Azerbaijan, 2013). Five hours after ceasing the discharge, modelling indicates that the plume will have dispersed to concentrations <5 ppm.

Cement is the most common material currently used in artificial reefs around the world and is inert. The potential for toxicity is associated with chemical additives that may be added to cement mixtures. Therefore, the toxicity associated with the discharge of cement is limited to the subsurface release of cement (not discharge of slurrified or dry cement). Once the cement has hardened, chemical additives are locked into the cement (Terrens et al., 1998) and not expected to pose any toxicological risk to benthic biota from leaching or direct contact. Most cement discharges that will occur during the drilling activities will be at the seabed during cementing of the casing. Once overspill from cementing activities hardens, the physical sediment properties of the area directly adjacent to the well (10–50 m) will be permanently altered (Terrens et.al., 1998). The potential disturbance area is an estimated 0.007 km² per well; giving a total potential disturbance footprint of ~0.21 km² for the proposed wells. Cement discharges at the seabed will overlap with the highest deposition of drill cuttings and drilling fluids. The highly localised physical footprint at the well site is not expected to affect the overall diversity or ecosystem function of the benthic communities of the area.

The potential impacts to benthic communities caused by smothering from a surface release of cement are expected to be significantly less, due to small volumes, intermittent nature of these discharges, and high potential for dispersal by ocean currents. This impact on soft sediment communities is not expected to affect the diversity or ecosystem function in this area and is only considered a localised impact.

***Subsea Control Fluids***

Subsea control fluids are water-based hydraulic fluids containing ~3% active ingredients. Modelling undertaken for another offshore drilling project indicates that a release of subsea control fluids during function testing is expected to reach a dilution of 3000 times within a maximum displacement of the plume within 98 m distance from the release site (BP Azerbaijan, 2013). Based on this information, concentrations of subsea control fluid are expected to be ~10 ppm within 100 m of the well BOP. Using a conservative ocean current speed of 0.1 m/s, fluids would be expected to travel 100 m (and thus reach concentrations of 10 ppm) in ~16 minutes. Changes in water quality, would comprise the presence of low toxicity contaminants for a short duration and extent in the water column above the seabed.

Given the small volumes associated with this discharge and limited exposure times due to rapid dilution, any potential impact to this aspect is expected to be localised and short term. There is potential for some toxins in the control fluid to accumulate in the sediment, but due to the very small volumes and rapid dispersal, it is considered negligible.

***Produced Water***

As described above, during well unloading and completion activities about 100 bbl (16 $m^3$) of produced water will be yielded per well, which may be discharged via the well test water treatment package. Discharge will be instantaneous and of short duration, and will be rapidly dispersed and diluted with negligible impact to water quality.

***Subsea – Well Intervention Fluids***

Well intervention fluids are typically inert and of low-toxicity. These fluids may include subsea control fluid, completions fluids and well annular fluids. Any change to water quality is expected to be localised and temporary as discharges would be discrete and of short duration. Rapid dilution due to prevailing ocean currents in the open water environment would lead to any changes in water quality such as low toxicity contaminants being temporary (only for the duration of the discharge) and reducing water quality within a short distance of the discharge location.

***Summary of Assessment Outcomes***

| Receptor | Impact | Receptor Sensitivity Level | Magnitude | Impact Significance Level |
|---|---|---|---|---|
| Sediment Quality | Change in sediment quality | Low value (open water) | Minor | Slight (E) |
| Water Quality | Change in water quality | Low value (open water) | Slight | Negligible (F) |
| Plankton | Injury/ mortality to fauna | Low value (open water) | Slight | Negligible (F) |
| Epifauna and Infauna | Injury/ mortality to fauna | Low value | Minor | Slight (E) |
| KEFs | Change in habitat | High value habitat | Slight | Minor (D) |

***Overall Impact Significance Level:*** The overall impact significance level for routine and non-routine discharges of cement, cementing fluids, subsea well fluids, produced water and unused bulk product is D based on Minor impact to the high value receptors (KEFs). Further review on the potential recovery time of sediment quality and

Epifauna/Infauna receptors has increased the significance level from the OPP, but the overall impact significance level (D) is consistent with the level in the OPP.

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| No additional controls identified. | | | | |
| ***Good Practice*** | | | | |
| Subsea control and cementing fluids and additives will have an environmental assessment completed prior to use. | F: Yes.<br>CS: Minimal cost. Standard practice. | Environmental assessment of chemicals will reduce the consequence of impacts resulting from discharges to the marine environment by ensuring chemicals have been assessed for environmental acceptability. Planned discharges are required for the safe execution of activities and therefore no reduction in likelihood can occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 8.1** |
| For drilling and completion fluids, chemical reviews are performed. | F: Yes.<br>CS: Minimal cost. Standard practice. | Regular reviews will ensure chemicals selected for drilling and completions fluids remain ALARP. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.2** |
| Bulk operational discharges conducted under MODU's Permit to Work (PTW) system (to operate discharge valves/pumps). | F: Yes.<br>CS: Minimal cost. Standard practice. | The MODU's PTW may slightly reduce the volumes of bulk discharges occurring, but it is unlikely to be significant given that bulk discharges are often operationally required and cannot be eliminated. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.6** |
| Displacement, brine, workover or intervention fluids contaminated with hydrocarbons will be treated prior to discharge or contained.<br>If discharge specification not met the fluid will be returned to shore. | F: Yes.<br>CS: Minimal cost. Standard practice. | Ensuring <1% oil content will provide a small reduction in consequence when fluids are discharged to the environment. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.7** |
| During well unloading and completion activities, if produced water is not flared, it will be processed through the well test water treatment package | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduced toxicity to the marine environment when discharged. | Benefits outweigh cost/sacrifice. | Yes<br>**C 8.3** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| prior to discharge to the environment. | | | | |
| ***Professional Judgement – Eliminate*** | | | | |
| Do not use BOP/Xmas tree control fluids. | F: No. BOP and Xmas tree control fluids are critical to the operation of the BOP and Xmas trees.<br>CS: Not considered, control not feasible. | Not considered, control not feasible. | Not considered, control not feasible. | No |
| Return bulk cement, barite and bentonite for onshore disposal | F: No. The technical requirements to be able to undertake this safely are unresolved due to:<br>• significant risks with tank high pressure differentials to transfer material onshore<br>• high risk with the vessel to waste truck transfer due to tank corrosion concerns and pressure relief valve issues.<br>CS: Not considered. Control not feasible. | Not considered, control not feasible. | Not considered, control not feasible. | No |
| Options for use of excess bulk cement, bentonite and barite will be managed as per **Figure 6-1** and only discharged to the marine environment as a last option. | F: Yes.<br>However, the cement may not meet the required technical specifications, and hence not be usable.<br>CS: Minor. | Using excess bulk cement for subsequent wells would eliminate the bulk discharge of cement to the marine environment and eliminate the consequence of impacts from such activities. | Benefits outweigh cost/sacrifice | Yes<br>**C 8.4** |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| No additional controls identified. | | | | |
| **ALARP Statement:**<br>On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the impacts of cement, cementing fluids, subsea well fluids and unused bulk products. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts and risks are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.1.13.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall impact significance levels for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to routine and non-routine discharges of cement, cementing fluids, subsea well fluids, produced water and unused bulk product have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:***<br>The impact assessment has determined that, given the adopted controls, cement, cementing fluids, subsea well fluids and unused bulk products discharges are unlikely to result in an impact greater than minor. Further opportunities to reduce the impacts have been investigated above. The adopted controls are considered good practice.<br>The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of these discharges to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 1**<br>Undertake Petroleum Activities Program in a manner that does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results.<br>**EPO 11**<br>Undertake Petroleum Activities Program in a manner that does not result in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health.<br>**EPO 12**<br>Undertake Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of plankton including its life cycle and spatial distribution.<br>**EPO 13** | **C 8.1**<br>Subsea control and cementing fluids and additives will have an environmental assessment completed prior to use. | **PS 7.1**<br>All chemicals intended or likely to be discharge into the marine environment reduced to ALARP using the chemical assessment process. | **MC 7.1.1**<br>Records demonstrate chemical selection, assessment and approval process for selected chemicals is followed. |
| | **C 7.2**<br>See **Section 6.7.7** | **PS 7.2**<br>See **Section 6.7.7** | **MC 7.2.1**<br>See **Section 6.7.7** |
| | **C 7.6**<br>See **Section 6.7.7** | **PS 7.6**<br>See **Section 6.7.7** | **MC 8.2.1**<br>See **Section 6.7.7** |
| | **C 7.7**<br>See **Section 6.7.7** | **PS 7.5**<br>See **Section 6.7.7** | **MC 7.5.1**<br>See **Section 6.7.7** |
| | **C 8.3**<br>During well unloading and completion activities, if produced water is not flared, it will be processed through the well test water filtration treatment package prior to discharge to the environment. | **PS 8.3**<br>Produced water discharged to the marine environment achieves discharge specification of <30 ppm | **MC 8.3.1**<br>Records demonstrate that formation water met discharge specification. |
| | **C 8.4**<br>Options for use of excess bulk cement, bentonite and barite will be managed as per **Figure 6-1** and only discharged to the marine | **PS 8.4**<br>No bulk cement, bentonite or barite discharged without documented ALARP assessment | **MC 8.4.1**<br>Records demonstrate that, prior to discharge of excess bulk cement, bentonite or barite options for use were assessed. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| Undertake Petroleum Activities Program in a manner that will not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in an area defined as a Key Ecological Feature.<br>**EPO 14**<br>Undertake Petroleum Activities Program in a manner that prevents substantial change in sediment quality, which may adversely impact biodiversity, ecological integrity, social amenity or human.<br>**EPO 15**<br>Undertake Petroleum Activities Program in a manner that prevents significant impacts on the values of the Exmouth Plateau KEF. | environment as a last option. | | |

## 6.8 Unplanned Activities (Accidents, Incidents, Emergency Situations)

### 6.8.1 Quantitative Spill Risk Assessment Methodology

#### 6.8.1.1 Quantitative Hydrocarbon Spill Modelling

Quantitative hydrocarbon spill modelling was performed by RPS, on behalf of Woodside, using a three-dimensional hydrocarbon spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program). The model is designed to simulate the transport, spreading and weathering of specific hydrocarbon types under different environmental conditions (both meteorological and oceanographic). Near-field subsurface discharge modelling was performed using OILMAP, which predicts the droplet sizes that are generated by the turbulence of the discharge as well as the centreline velocity, buoyancy, width and trapping depth (if any) of the rising gas and oil plumes. The OILMAP output parameters were used as input into SIMAP.

The algorithms in the SIMAP model are based on the best available scientific knowledge and are updated when necessary in response to significant advances in knowledge. Recent improvements have been implemented to the entrainment algorithm, which have been adjusted to implement the findings of published data based on field research performed during the Macondo spill event in the Gulf of Mexico (Spaulding et al., 2017; Li et al., 2017; French McCay et al., 2018).

Stochastic modelling was conducted for this study, which compiled data from 200 hypothetical spills under different environmental conditions to determine the widest extent of possible oil dispersion. The environmental conditions for each of the hypothetical spills were selected randomly from an historic time-series of wind and current data representative of the study area. Results of the replicate simulations were then statistically analysed and mapped to define contours of percentage probability of contact at identified thresholds around the hydrocarbon release point. The simulations that show something unusual or unexpected make an important contribution to the overall outcomes and fate of the hydrocarbon.

The model simulates surface releases and uses the unique physical and chemical properties of a representative hydrocarbon type to calculate rates of evaporation and viscosity change, including the tendency to form oil-in-water emulsions. Moreover, the unique transport and dispersion of surface slicks and in-water components (entrained and dissolved) are modelled separately. Thus, the model can be used to understand the wider potential consequences of a spill, including direct contact of hydrocarbons due to surface slicks (floating hydrocarbon) and exposure of organisms to entrained and dissolved aromatic hydrocarbons in the water column. The model also calculates the accumulation of hydrocarbon mass that arrives on each section of shoreline over time, taking into account any mass that is lost to evaporation and/or subsequent removal by current and wind forces.

All hydrocarbons spill modelling assessments performed by RPS undergo initial sensitivity modelling to determine appropriate time to add to the simulation after the cessation of the spill. The amount of time following the spill is based on the time required for the modelled concentrations to practically drop below threshold concentrations anywhere in the model domain in the test cases.

#### 6.8.1.2 Worst-case Scenario

In assessing the potential impacts of an unplanned hydrocarbon release, representative worst-case scenarios (in terms of volume and location) were assessed. A summary of the credible hydrocarbon spill scenarios that could occur during Scarborough drilling are provided in **Table 6-9**.

**Table 6-9: Credible hydrocarbon spill scenarios**

| Scenario | Hydrocarbon type | Maximum credible volume | Location |
|---|---|---|---|
| Vessel collision resulting in rupture of a tank | MDO | 250 $m^3$ | Within PAA |

| Scenario | Hydrocarbon type | Maximum credible volume | Location |
|---|---|---|---|
| Loss of well integrity | Dry gas | No or negligible liquid hydrocarbon | Well locations |
| Loss of containment during bunkering | MDO | 50 $m^3$ | MODU location |

For the Petroleum Activities Program, the worst-case scenario was identified to be an instantaneous surface release of 250 $m^3$ of MDO, representing loss of vessel fuel tank integrity following a collision. As the worst-case scenario, the following assessment of impacts will also address the potential impacts of other credible lesser releases.

### 6.8.1.3 Environment that May Be Affected and Hydrocarbon Contact Thresholds

The outputs of the quantitative hydrocarbon spill modelling are used to assess the environmental risk, if a credible hydrocarbon spill scenario occurred, by delineating which areas of the marine environment could be exposed to hydrocarbon levels exceeding hydrocarbon threshold concentrations. The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as the 'environment that may be affected' (EMBA), which is driven by the worst-case credible hydrocarbon spill scenario, which, in this instance, is the loss of 250 $m^2$ in the event of a vessel collision resulting in a fuel tank rupture.

As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, the EMBA combines the potential spatial extent of the different fates.

The EMBA covers a larger area than the area that is likely to be affected during any single spill event, as the model was run for a variety of weather and metocean conditions. The EMBA therefore represents the total extent of all the locations where hydrocarbon thresholds could be exceeded from all modelling runs.

Surface and accumulated shoreline hydrocarbon concentrations are expressed as grams per square metre ($g/m^2$), with entrained and dissolved aromatic hydrocarbon concentrations expressed as parts per billion (ppb). A conservative approach adopting accepted contact thresholds that are documented to impact the marine environment are used to define the EMBA. These hydrocarbon thresholds are presented in **Table 6-10** and described in the following subsections.

Woodside recognises that hydrocarbons may be present beyond the ecological impact EMBA at low concentrations that may be visible but are not expected to cause ecological impacts. The threshold for visible surface oil (1 $g/m^2$) has therefore been used to define an additional boundary within which socio-cultural impacts to the visual amenity of the marine environment may occur. This area is referred to as the socio-cultural EMBA. Any ecological impacts from dissolved and entrained hydrocarbons above prescribed thresholds, as in **Table 6-10**, may also result in socio-cultural impacts. Potential impacts to socio-cultural values assessed within these EMBAs include:

- protected areas
- national and Commonwealth Heritage Listed places
- tourism and recreation
- fisheries.

**Table 6-10:Summary of environmental impact thresholds applied to the quantitative hydrocarbon spill risk modelling results**

| Hydrocarbon Type | EMBA | | | | Socio-cultural EMBA |
|---|---|---|---|---|---|
| | Surface Hydrocarbon ($g/m^2$) | Entrained hydrocarbon (ppb) | Dissolved aromatic hydrocarbon (ppb) | Accumulated hydrocarbons ($g/m^2$) | Surface Hydrocarbon ($g/m^2$) |
| Diesel | 10 | 100 | 50 | 100 | 1 |

### 6.8.1.4 Surface Hydrocarbon Threshold Concentrations

The spill modelling outputs defined the EMBA for surface hydrocarbons resulting from a spill (contact on surface waters) using a threshold of ≥10 g/m² for diesel. This threshold is used to define an area within which ecological impacts to the marine environment may occur from surface hydrocarbons. It represents the minimum oil thickness (0.01 mm) at which ecological impacts (e.g. to birds and marine mammals) are expected to occur.

Thresholds for registering biological impacts resulting from contact of surface slicks have been estimated by different researchers at about 10–25 g/m² (French et al., 1999; Koops et al., 2004; National Oceanic and Atmospheric Administration, 1996). Potential impacts of surface slick concentrations in this range for floating hydrocarbons may include harm to seabirds through ingestion from preening of contaminated feathers, or the loss of the thermal protection of their feathers. The 10 g/m² threshold is the reported level of oiling to instigate impacts to seabirds and is also applied to other wildlife, though it is recognised that 'unfurred' animals, where hydrocarbon adherence is less, may be less vulnerable. 'Oiling' at this threshold is taken to be of a magnitude that can cause a response from the most vulnerable wildlife such as seabirds. Due to weathering processes, surface hydrocarbons will have a lower toxicity due to change in their composition over time. Potential impacts to shoreline sensitive receptors may be markedly reduced in instances where there is extended duration until contact.

A surface threshold of 10 g/m² represents a 'dull metallic colour' (Bonn Agreement, 2015) (**Table 6-11**). A lower concentration of 1 $g/m^2$ is used to define an area within which social-cultural impacts to the visual amenity of the marine environment may occur. The surface threshold of ≥1 g/m² is based on the relationship between film thickness and appearance (Bonn Agreement oil appearance code, 2015), and represents a 'rainbow sheen' appearance. This threshold is considered below levels which would cause ecological impacts, and instead represents potential for visual amenity impacts. This threshold area is referred to as the 'socio-cultural EMBA'.

**Table 6-11: The Bonn Agreement oil appearance code**

| Appearance (following Bonn visibility descriptors) | Mass per area ($g/m^2$) | Thickness (µm) | Volume per area ($L/km^2$) |
|---|---|---|---|
| Discontinuous true oil colours | 50 to 200 | 50 to 200 | 50,000 to 200,000 |
| Dull metallic colours | 5 to 50 | 5 to 50 | 5000 to 50,000 |
| Rainbow sheen | 0.30 to 5.00 | 0.30 to 5.00 | 300 to 5000 |
| Silver sheen | 0.04 to 0.30 | 0.04 to 0.30 | 40 to 300 |

### 6.8.1.5 Accumulated Hydrocarbon Threshold Concentrations

Owens and Sergy (1994) define accumulated hydrocarbon <100 g/m² to have an appearance of a stain on shorelines. French-McCay (2009) defines accumulated hydrocarbons ≥100 g/m² to be the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates

living in intertidal habitat. A threshold of ≥100 g/m² has been adopted as the threshold for shoreline accumulation and has been included in the EMBA. Further, any ecological impacts at the shoreline accumulation threshold may also result in socio-cultural impacts.

#### 6.8.1.6 Dissolved Aromatic Hydrocarbon Threshold Concentrations

Dissolved hydrocarbons present a narcotic effect resulting from uptake into the tissues of marine organisms. This effect is additive, increasing with exposure concentration or with time of exposure (French-McCay, 2002; NRC, 2005). The dissolved aromatic threshold of 50 ppb has been selected as a medium level threshold to approximate the potential toxic effects, particularly sublethal effects to sensitive species, as consistent with the NOPSEMA Oil Spill Modelling Guidance Bulletin (NOPSEMA, 2019).

#### 6.8.1.7 Entrained Hydrocarbon Threshold Concentrations

This threshold is used to define an area within which ecological impacts to the marine environment may occur from entrained hydrocarbons. Therefore, it may also be associated with socio-cultural impacts.

Entrained hydrocarbons present a number of possible mechanisms for toxic exposure to marine organisms. The entrained hydrocarbon droplets may contain soluble compounds, hence have the potential for generating elevated concentrations of dissolved aromatic hydrocarbons (e.g. if mixed by breaking waves against a shoreline). Physical and chemical effects of the entrained hydrocarbon droplets have also been demonstrated through direct contact with organisms; for example, through physical coating of gills and body surfaces, and accidental ingestion (National Research Council, 2005).

The entrained threshold has been selected to be consistent with the NOPSEMA Oil Spill Modelling Guidance Bulletin (NOPSEMA, 2019). An entrained threshold of 100 ppb is considered to be appropriate given the oil characteristics for informing potential impacts to receptors.

#### 6.8.1.8 Scientific Monitoring

A planning area for scientific monitoring is also described in Section 5.6 of the Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**). This planning area has been set with reference to the low exposure entrained value of 10 ppb detailed in NOPSEMA Bulletin #1 Oil Spill Modelling (2019).

A scientific monitoring program would be activated following a Level 2 or 3 unplanned hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. This would consider receptors at risk (ecological and socio-economic) for the entire predicted EMBA and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the worst-case credible spill scenario(s) or other identified unplanned hydrocarbon releases associated with the operational activities.

## 6.8.2 Unplanned Hydrocarbon Release: Vessel Collision

**Scarborough OPP – Relevant Impact Assessment Section**

Section 7.2.6 (Unplanned Hydrocarbon Release)

**Context**

| Relevant Activities | Existing Environment | Consultation |
|---|---|---|
| Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1** | Physical Environment – **Section 4.2**<br>Habitats and Biological Communities – **Section 4.5**<br>Protected Species – **Section 4.6**<br>Protected Places – **Section 4.8**<br>Socio-economic Environment – **Section 4.9** | Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Loss of hydrocarbons to marine environment due to a vessel collision (e.g. project vessels or other marine users) | | | X | | X | X | X | A | D | 1 | M | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 16 |

**Description of Source of Impact/Risk**

***Background***

The temporary presence of the MODU and project vessels in the PAA will result in a navigational hazard for commercial shipping within the immediate area (as discussed in **Section 6.7.4**). This navigational hazard could result in a third party vessel colliding with the MODU or a project vessel which could release hydrocarbons.

A MODU will have a total marine diesel capacity of approximately 966 to 1400 $m^3$ (up to 3640 $m^3$ for DP MODU), that is distributed through a number of isolated tanks. MODU fuel tanks are located in the MODU pontoons, typically located on the inner sides of pontoons and can be over 10 m below the waterline.

A typical project vessel (e.g. an installation or subsea support vessel) is likely to have multiple isolated marine diesel tanks distributed throughout the hull of the vessel. The marine diesel storage capacity of a support vessel can be in the order of 1000 $m^3$ (total) that is distributed through multiple isolated tanks typically located mid-ships and can range in typical size from 22 to 105 $m^3$. Subsea installation vessels can have fuel tank sizes ranging from 111 $m^3$–247 $m^3$.

In the unlikely event of a vessel collision involving a project vessel during the Petroleum Activities Program, the vessel will have the capability to pump marine diesel from a ruptured tank to a tank with spare volume in order to reduce the potential volume of fuel released to the environment. A volume of 250 $m^3$ of MDO is considered an appropriate worst-case for a single fuel tank, based on existing facilities.

***Industry Experience***

Registered vessels or foreign flag vessels in Australian waters are required to report events to the Australian Transport Safety Bureau (ATSB), AMSA or Australian Search and Rescue (AusSAR).

From a review of the ATSB marine safety and investigation reports, one vessel collision occurred in 2011/12 that resulted in a spill of 25–30 L of oil into the marine environment as a result of a collision between a tug and support vessel off Barrow Island. Two other vessel collisions occurred in 2010, one in the port of Dampier, where a support vessel collided

with a barge being towed. Minor damage was reported and no significant injury to personnel or pollution occurred. The second 2010 vessel collision involved a vessel under pilot control in port connecting with a vessel alongside a wharf, causing it to sink. No reported pollution resulted from the sunken vessel. These incidents demonstrate the likelihood of only minor volumes of hydrocarbons being released during the highly unlikely event of a vessel collision.

From 2010 to 2011, the ATSB's annual publication defines the individual safety action factors identified in marine accidents and incidents: 42% related to navigation action (2011). Of those, 15% related to poor communication and 42% related to poor monitoring, checking and documentation (ATSB, 2011). The majority of these related to the grounding instances.

***Credible Scenario***

For a vessel collision to result in the worst-case scenario of a hydrocarbon spill potentially impacting an environmental receptor, several factors must align as follows:

- The identified causes of vessel interaction must result in a collision.
- The collision must have enough force to penetrate the vessel hull.
- The collision must be in the exact location of the fuel tank.
- The fuel tank must be full, or at least of volume which is higher than the point of penetration.

The environmental risk analysis and evaluation identified and assessed a range of potential scenarios that could result in a loss of vessel structural integrity, resulting in damage to fuel storage tank(s) and a loss of marine diesel to the marine environment (**Table 6-12**). The scenarios considered damage to single and multiple fuel storage tanks in a project vessel and MODU due to dropped objects and various combinations of vessel to vessel and vessel to MODU collisions. In summary:

- It is not a credible scenario that the total storage volume of the MODU would be lost, as fuel is stored in more than one tank.
- It is not a credible scenario that a storage tank on the MODU would be damaged due to the location of the tanks within the hull, behind the bilge tanks, below the waterline.
- It is not a credible scenario that a collision between the support vessel and MODU would damage any storage tanks, due to the location of the tanks on both vessel types and secondary containment.
- It is highly unlikely that the full volume of the largest storage tank on a support vessel would be lost.

The last scenario considered was a collision between the support vessel or installation vessel with a third-party vessel (i.e. commercial shipping, other petroleum related vessels and commercial fishing vessels). This was assessed as being credible but highly unlikely, given the standard vessel operations and equipment in place to prevent collision at sea, the standby role of a support vessel (low vessel speed) and its operation in close proximity to the MODU (exclusion areas), and the construction and placement of storage tanks. Potential spill volumes for these scenarios are summarised in the **Table 6-12.**

Given the offshore location of the PAA, vessel grounding is not considered a credible risk.

**Table 6-12: Summary of credible hydrocarbon spill scenario as a result of vessel collision**

| Scenario | Hydrocarbon Volumes | Preventative and Mitigation Controls | Credibility |
|---|---|---|---|
| Breach of MODU fuel tanks due to vessel collision. | MODU has a fuel oil storage capacity of about 966 to 1400 $m^3$ (up to 3640 $m^3$ for DP MODU), distributed through multiple tanks. | Fuel tanks are located on the inside of pontoons and protected by location below water line, protection from other tanks, e.g. bilge tanks.<br>The draught of vessel and location of tanks in terms of water line prevent the tanks from being breached. | Not credible<br>Due to location of tanks. |
| Breach of support vessel fuel tanks due to collision with MODU. | Activity support vessel has multiple marine diesel tanks typically ranging between 22 to 105 $m^3$ each. | Typically, double wall tanks that are located mid ship (not bow or stern).<br>Slow support vessel speeds when in proximity to MODU. | Not credible<br>Collision with MODU at slow speeds is highly unlikely and, if it did occur, is highly unlikely to result in a breach of support vessel (low energy contact from slow moving vessel). |

| | | | |
|---|---|---|---|
| Breach of installation vessel fuel tanks due to collision with third-party vessel, including commercial shipping and fishing. | Largest volume of a single tank is likely to be <250 $m^3$. | Tank locations midship (not bow or stern). | Credible<br>Installation vessel – third-party vessel collision could potentially result in the release from a fuel tank. |
| Breach of project support vessel fuel tanks due to support vessel – other vessel collision including commercial shipping/fisheries. | Activity support vessel has multiple marine diesel tanks typically ranging between 22 to 105 $m^3$ each. | Typically, double wall tanks that are located midship (not bow or stern).<br>Vessels are not anchored and steam at low speeds when relocating within the PAA or providing stand-by cover. Normal maritime procedures would apply during such vessel movements. | Credible<br>Activity support vessel – other vessel collision could potentially result in the release from a fuel tank. |

***Quantitative Hydrocarbon Risk Assessment***

To inform the impact assessment, quantitative hydrocarbon spill modelling was undertaken for the worst-case hydrocarbon release scenario (RPS, 2019). It is not practicable for spill modelling to be undertaken at every potential spill location within the PAA. The release location was selected by considering locations that would:

- have the greatest potential environmental consequence to the receiving environment (closest to sensitive receptors)
- be considered at greater risk of a spill event.

Accordingly, existing modelling for a spill of MDO within WA-61-L at the approximate location of the proposed FPU (the installation and operation of the FPU is outside the scope of this Activity). The FPU location is considered conservative, as it is located closer to shoreline receptors than the wells. The coordinates of the location are detailed in **Table 6-13**.

**Table 6-13: Spill release locations for 250 $m^3$ MDO spill**

| Location | Coordinates |
|---|---|
| Location of the FPU | 19° 55'33.60'' S<br>113° 14' 31.20''E |

***Hydrocarbon Characteristics***

MDO is a non-persistent fuel oil and contains a small proportion of heavy components (or low volatile components) that tend to physically entrain into the upper water column in the presence of moderate winds (i.e. >12 knots) and breaking waves but may re-float to the surface if these conditions abate. In the event of a substantial spill, the heavier components can remain entrained or remain on the sea surface for an extended period. The characteristics of the marine diesel are given in **Table 6-14**.

When spilt into the warm tropical and subtropical marine environment expected, MDO spreads rapidly and forms a very thin slick, with most of the volatile components typically evaporating in less than a day. Approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending on the prevailing wind conditions, with further evaporation slowing over time. The heavier (low volatility) components of the oil tend to entrain into the upper water column due to wind-generated waves, but can subsequently resurface depending on conditions (RPS, 2019).

RPS conducted weathering simulations to illustrate the potential behaviour of MDO when exposed at the water's surface under constant (5 knots) and variable wind conditions (**Figure 6-2** and **Figure 6-3**). Variable wind conditions generate greater entrainment of the hydrocarbon in the water column. Approximately 24 hours after the spill, around 45% of the oil mass is forecast to have entrained and a further 36% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<1%). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves (approximately >6 m/s).

Variable wind does result in a higher percentage of biological and photochemical degradation, with an approximate rate of 1.8% per day. Whereas the constant wind scenario shows ~50% of the oil evaporates within 36 hours with negligible entrainment, but with a rate of only ~0.2% degradation per day.

**Table 6-14: Characteristics of the marine diesel**

| Hydrocarbon type | Initial density (g/cm³) at 25 °C | Viscosity (cP @ 25 °C) | Component BP (°C) | Volatiles %<180 | Semi volatiles % 180–265 | Low volatility (%) 265-380 | Residual (%) >380 |
|---|---|---|---|---|---|---|---|
| | | | | Non-Persistent | | | Persistent |
| Marine diesel | 0.829 | 4.0 | % of total | 6 | 34.6 | 54.4 | 5 |

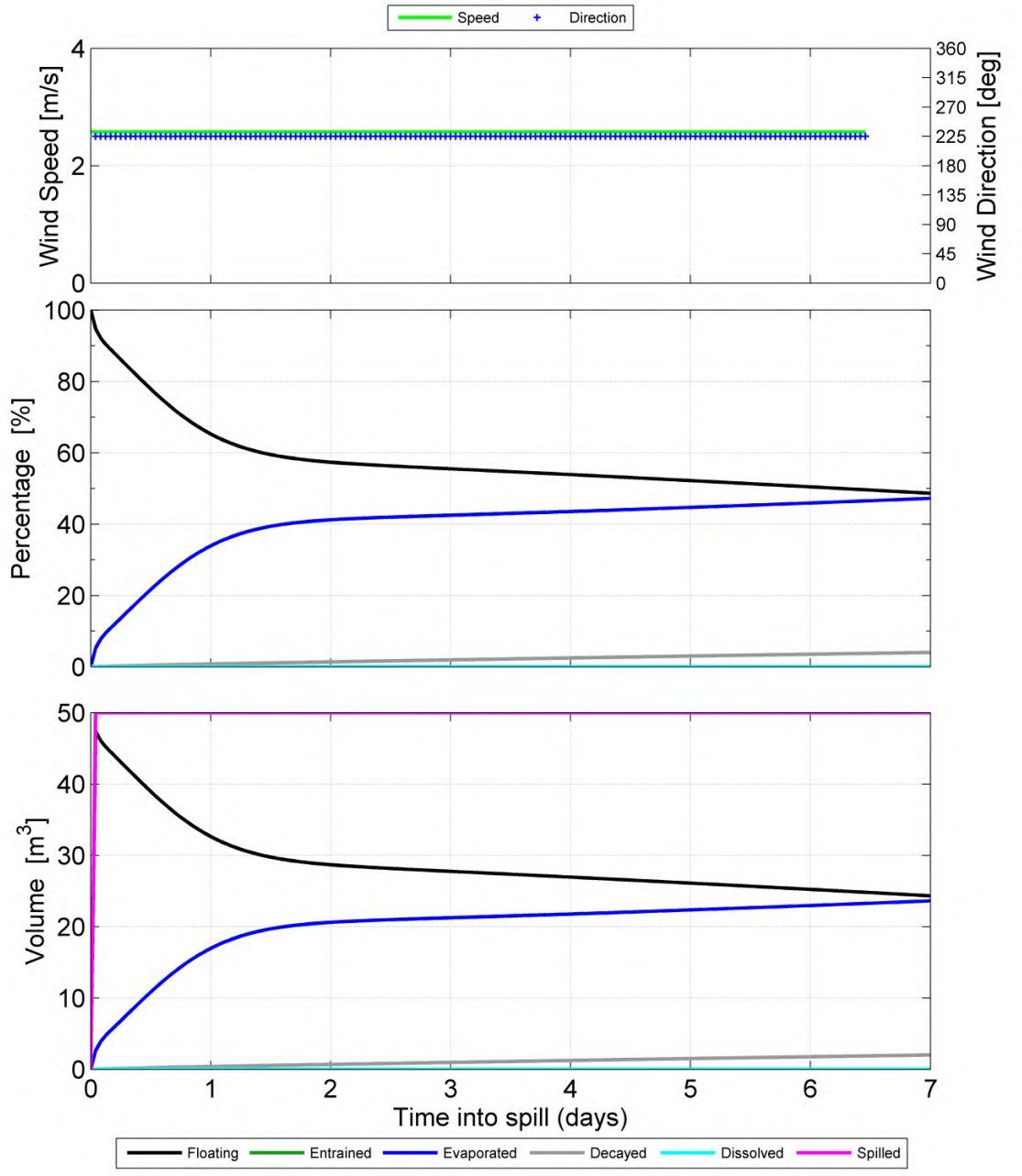

**Figure 6-2: Mass balance plot representing, as proportion (middle panel) and volume (bottom panel), the weathering of marine diesel spilled onto the water surface as a one-off release (50 m$^3$ over one hour) and subject to a constant 5 kn (2.6 m/s) wind at 27 °C water temperature and 25 °C air temperature**

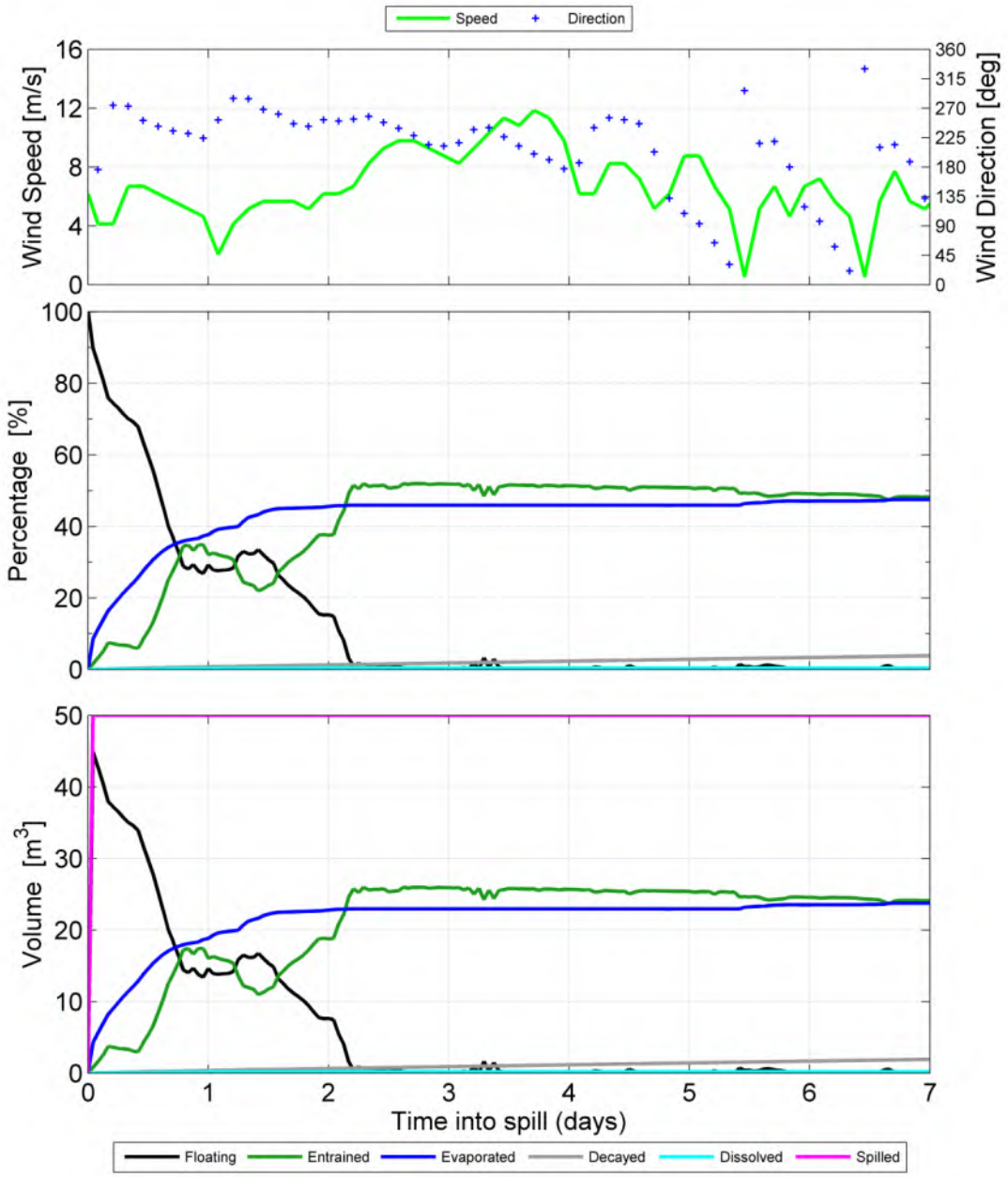


**Figure 6-3: Proportional mass balance plot representing weathering of a surface spill of marine diesel as a one-off release (50 m$^3$ over 1 hour) and subject to variable wind at 27 °C water temperature and 25 °C air temperature**

*(Source: RPS, 2019)*

## Detailed Impact Assessment

### *Assessment of Potential Impacts*

#### *Environment that May Be Affected*

**Surface Hydrocarbons**: If this scenario occurred, a surface hydrocarbon slick would form down-current of the release location, with the trajectory dependent on prevailing wind and current conditions at the time. The modelling indicates

that the EMBA would be confined to open water, with surface hydrocarbons extending up to about 52 km from the release location at or above the 10 g/m² impact threshold. No contact with sensitive receptor locations is predicted.

A socio-cultural EMBA for surface hydrocarbons which includes the threshold for visible surface hydrocarbons of 1 g/m$^2$ may extend up to about 58 km from the release site.

**Entrained Hydrocarbons**: Quantitative hydrocarbon spill modelling results are shown in **Table 6-15**. If this vessel collision scenario occurred, a plume of entrained hydrocarbons would form down-current of the release location, with the trajectory dependent on prevailing current conditions at the time. The modelling indicates that locations exposed to entrained hydrocarbons at or above the threshold concentration of 100 ppb are restricted to offshore areas up to about 236 km from the release site. The only receptor predicted to be contacted by entrained oil concentrations at the 100 ppb threshold was Gascoyne Marine Park (**Table 6-15**). The maximum entrained oil concentration forecast for Gascoyne Marine Park was 998 ppb.

**Dissolved Hydrocarbons**: Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 50 ppb threshold are predicted to be found up to 145 km from the spill site. No contact with sensitive receptor locations is predicted.

**Accumulated Hydrocarbons:** Accumulated hydrocarbons above threshold concentrations (≥100 g/m²) were not predicted by the modelling to occur at any location.

***Water Quality***

The highly-mixed, open water location and characteristics of hydrocarbons released will result in rapid evaporation and dispersion. However, MDO contains a small proportion of heavy components (or low-volatile components) that tend to physically entrain into the upper water column in the presence of moderate winds (i.e. >12 knots) and breaking waves but may resurface if these conditions abate. If a substantial spill occurred, the heavier components could remain entrained or remain on the sea surface for an extended period and travel significant distances from the source, albeit at low concentrations.

The hydrocarbon characteristics of MDO mean that in variable wind conditions, it is expected that approximately 24 hours after the spill, around 45% of the oil mass is forecast to have entrained and a further 36% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<1%) (RPS, 2019).

Given the control measures in place to prevent unplanned hydrocarbon releases, and the offshore location of Scarborough and hydrocarbon characteristics, the change to water quality resulting from unplanned hydrocarbon releases will be temporary and habitat or ecosystem function or integrity will not be impacted.

Based on the detailed risk evaluation, the magnitude of potential impact of a change in water quality from unplanned release of MDO is assessed as slight. Receptor sensitivity of water quality is low (low value, open ocean), and therefore the consequence of a release of hydrocarbons on water quality is Negligible (F).

***Plankton***

Injury/mortality to planktonic species may occur due to a change in water quality following an unplanned hydrocarbon release.

Primary production by plankton (supported by sporadic upwelling events in the offshore waters of the NWS) is an important component of the primary marine food web. Planktonic communities are generally mixed, including phytoplankton (cyanobacteria and other microalgae) and secondary consuming zooplankton, such as crustaceans (e.g. copepods), and the eggs and larvae of fish and invertebrates (meroplankton).

Exposure to hydrocarbons in the water column (entrained or dissolved) can change species composition, with declines or increases in one or more species or taxonomic groups (Batten et al., 1998). Phytoplankton may also experience decreased rates of photosynthesis (Tomajka, 1985). For zooplankton, such as fish, coral and invertebrate eggs and larvae, direct effects of contamination may include toxicity, suffocation, changes in behaviour, or environmental changes that make them more susceptible to predation. Impacts on plankton communities are likely to occur in areas where entrained or dissolved aromatic hydrocarbon threshold concentrations are exceeded, but communities are expected to recover relatively quickly (within weeks or months). This is due to high population turnover, with copious production within short generation times that also buffers the potential for long-term (i.e. years) population declines (International Tanker Owners Pollution Federation, 2011a).

When first released, MDO has a higher toxicity due to the presence of the volatile components. Plankton making contact close to the spill source at the time of the spill may be impacted, however, due to low planktonic productivity within the NWMR it is unlikely that large populations of plankton will be affected at the sea surface above thresholds as this is only predicted for the first few days after the spill.

Given hydrocarbon characteristics, expected rapid weathering and then degradation of the entrained component to below impact thresholds, and relatively quick recovery times of plankton, unplanned releases from Scarborough are not expected to have a substantial adverse effect on plankton life cycle and spatial distribution.

There are no Management Plans, Recovery Plans or Conservation Advice related to plankton.

Based on the detailed risk evaluation, the magnitude of potential impact to plankton from unplanned release of MDO is assessed as slight. Receptor sensitivity of plankton is low (low value, open water), and therefore the consequence of a release of hydrocarbons on plankton is Negligible (F).

***Fish***

Injury/mortality to fish species may occur due to a change in water quality following an unplanned hydrocarbon release. Any surface and subsurface hydrocarbon release could impact fish, as they are widely dispersed throughout the water column.

Impacts to sharks and rays may occur through direct contact with hydrocarbons and contaminate the tissues and internal organs, either through direct contact or via the food chain (consumption of prey). As gill breathing organisms, sharks and rays may be vulnerable to toxic effects of dissolved hydrocarbons (entering the body via the gills) and entrained hydrocarbons (coating of the gills inhibiting gas exchange). In the offshore environment, it is probable that pelagic shark species are able to detect and avoid hydrocarbons by swimming into deeper water or away from the affected areas.

Fish mortalities are rarely observed to occur as a result of hydrocarbon spills (International Tanker Owners Pollution Federation, 2011b). This has generally been attributed to the possibility that pelagic fish are able to detect and avoid surface waters underneath hydrocarbon spills by swimming into deeper water or away from the affected areas. Fish that have been exposed to dissolved aromatic hydrocarbons are capable of eliminating the toxicants once placed in clean water; hence, individuals exposed to a spill are likely to recover (King et al., 1996). Where fish mortalities have been recorded, the spills (resulting from the groundings of the tankers Amoco Cadiz in 1978 and the Florida in 1969) have occurred in sheltered bays.

Laboratory studies have shown that adult fish can detect hydrocarbons in water at very low concentrations, and large numbers of dead fish have rarely been reported after hydrocarbon spills (Hjermann et al., 2007). This suggests that juvenile and adult fish can avoid water contaminated with high concentrations of hydrocarbons.

The effects of exposure to oil on the metabolism of fish appear to vary according to the organs involved, exposure concentrations and route of exposure (waterborne or food intake). Oil reduces the aerobic capacity of fish exposed to aromatics in the water, and to a lesser extent affects fish consuming contaminated food (Cohen et al., 2005). The liver, a major detoxification organ, appears to be where anaerobic activity is most impacted, probably increasing anaerobic activity to help eliminate ingested oil from the fish (Cohen et al., 2005).

Fish are perhaps most susceptible to the effects of spilled oil in their early life stages, particularly during egg and planktonic larval stages, which can become entrained in spilled oil. Contact with oil droplets can mechanically damage feeding and breathing apparatus of embryos and larvae (Fodrie and Heck, 2011). The toxic hydrocarbons in water can result in genetic damage, physical deformities and altered developmental timing for larvae and eggs exposed to even low concentrations over prolonged timeframes (days to weeks) (Fodrie and Heck, 2011). More subtle, chronic effects on the life history of fish because of exposure in early life stages to hydrocarbons include disruption to complex behaviour such as predator avoidance, reproductive and social behaviour (Hjermann et al., 2007). Prolonged exposure of eggs and larvae to weathered concentrations of hydrocarbons in water has also been shown to cause immunosuppression and allows expression of viral diseases (Hjermann et al., 2007).

Adult fish exposed to low hydrocarbon concentrations are likely to metabolise the hydrocarbons and excrete the derivatives, with studies showing that fish can metabolise petroleum hydrocarbons and that accumulated hydrocarbons are released from tissues when the fish is returned to hydrocarbon-free sea water. Several fish communities in these areas are demersal (i.e. living closer to the seabed) where concentrations of entrained hydrocarbons will be lower; any impacts are expected to be highly localised.

Marine fauna with gill-based respiratory systems are expected to have higher sensitivity to exposures of entrained contaminants. Therefore, the receptors most susceptible to dissolved hydrocarbons are fish and whale sharks. Whale sharks are not expected to be present in the EMBA given its offshore location (based on Protected Matters Search results). MDO does not tend to have a high proportion that dissolves – all three release locations predict low probabilities and low concentration to intersect with sensitive receptors.

When first released, MDO has a higher toxicity due to the presence of the volatile components. Individual fish making contact close to the spill source at the time of the spill may be impacted. Fish presence is generally concentrated in waters closer to shore. Although fish presence may occur throughout the entire PAA and defined EMBA, it is unlikely that a large number of fish will be affected at the sea surface above thresholds, as this is only <1-15% remaining on the surface after 7 days. Mobile transient fauna is not expected to remain within entrained hydrocarbon plumes for an extended time. Therefore, no acute impacts or risks associated with entrained exposures from an unplanned MDO release are expected. Any impacts from this exposure are expected to result in localised short-term effects to limited small numbers of juvenile fish and prey species (larvae and planktonic organisms), which are not expected to affect population viability and recruitment of fish. Consequently, diverse fish assemblages are not expected to be significantly impacted.

Although potential impacts could include mortality or sub-lethal injury/illness of pelagic fish, this would be expected to comprise a small proportion of the resident and transitory population. Given hydrocarbon characteristics, expected rapid weathering to below impact thresholds and degradation of entrained fractions, and the mobile transient nature of fish, unplanned releases of MDO are not expected to have a substantial adverse effect on the population or spatial distribution of fish; or substantially modify, destroy or isolate an area of important habitat for migratory species. Additionally, unplanned releases will not seriously disrupt the lifecycle of an ecologically significant proportion of any migratory fish species.

There are specific conservation advices for some fish species which identify habitat degradation/modification as a key threat. While for some species there are specific requirements (e.g. sawfish), no specific requirements have been identified for relevant species (i.e. species identified as having potential to occur in the EMBA).

Based on the detailed risk evaluation, the magnitude of potential impacts to fish from unplanned hydrocarbon releases is assessed as slight. Receptor sensitivity of fish is high (high value fauna), and therefore the consequence of a release of hydrocarbons on fish is Minor (D).

***Marine Mammals***

A change in marine fauna behaviour or injury/mortality to marine mammals may occur due to a change in water quality after an unplanned hydrocarbon release.

Air-breathing fauna such as marine mammals are most at risk from surface exposures due to the high volatile components. Marine mammals that have direct physical contact with surface, entrained or dissolved aromatic hydrocarbons may suffer surface fouling, ingest hydrocarbons and inhale toxic vapours. This may result in the irritation of sensitive membranes such as the eyes, mouth, digestive and respiratory tracts and organs, impairment of the immune system or neurological damage (Helm et al., 2015). If prey (fish and plankton) are contaminated, this can result in the absorption of toxic components of the hydrocarbons (PAHs).

In a review of cetacean observations in relation to a number of large-scale hydrocarbon spills, Geraci (1988) found little evidence of mortality associated with hydrocarbon spills. However, behavioural disturbance (i.e. avoiding spilled hydrocarbons) was observed in some instances for several species of cetaceans. This suggests that cetaceans are able to detect and avoid surface slicks. While this reduces the potential for physiological impacts from contact with hydrocarbons, active avoidance of an area may disrupt behaviours such as migration, or displace individuals from important habitat, such as foraging, resting or breeding.

When first released, MDO has a higher toxicity due to the presence of the volatile components. Individual cetaceans making contact close to the spill source at the time of the spill may be impacted. Cetacean presence is generally more concentrated in waters closer to shore with the exception of false killer whales. Although cetacean presence may occur throughout the PAA and defined EMBA, it is unlikely that a large number of cetaceans will be affected at the sea surface above thresholds, as dependant on wind conditions, weathering predicts that only <1–15% of hydrocarbon remains on the surface after about seven days (RPS, 2019d).

Although potential impacts could include mortality or sub-lethal injury/illness of marine mammals, this would be expected to comprise a small proportion of the resident and transitory population. Given hydrocarbon characteristics, expected rapid weathering of surface oil to below impact thresholds, and the mobile transient nature of marine mammals and potential avoidance behaviour, unplanned releases of MDO are not expected to have a substantial adverse effect on the population or spatial distribution of marine mammals; or substantially modify, destroy or isolate an area of important habitat for migratory species. Additionally, unplanned releases will not seriously disrupt the lifecycle of an ecologically significant proportion of any migratory species.

There are specific conservation advices for some species which identify noise interference and vessel disturbance as key threats. While hydrocarbon spills are not explicitly identified as a threat, the sei whale conservation advice does include the management of physical disturbance and development activities. No explicit management actions are identified relevant to hydrocarbon spills.

Potential impacts are unlikely to lead to mortality or sub-lethal injury/illness of an EPBC-listed protected species. Based on the detailed risk evaluation, the magnitude of potential impacts to marine mammals (focused on changes in behaviour) from unplanned MDO releases is assessed as slight. Receptor sensitivity of marine mammals is high (high value fauna), and therefore the consequence of a release of hydrocarbons on marine mammals is Minor (D).

***Marine Reptiles***

A change in marine fauna behaviour or injury/mortality to marine reptiles may occur due to a change in water or sediment quality following an unplanned hydrocarbon release.

Marine reptiles can be impacted by surface exposure when they surface to breathe, and by shoreline accumulation of hydrocarbons when breeding and nesting.

Hydrocarbons in surface waters may impact turtles when they surface to breathe and inhale toxic vapours. Their breathing pattern, involving large ‘tidal’ volumes and rapid inhalation before diving, results in direct exposure to petroleum vapours which are the most toxic component of the hydrocarbon spill (Milton and Lutz, 2003). This can lead to lung damage and congestion, interstitial emphysema, inhalant pneumonia and neurological impairment (National Oceanic and Atmospheric Administration, 2010). Contact with entrained hydrocarbons can result in hydrocarbon adherence to body surfaces, irritating mucous membranes in the nose, throat and eyes, leading to inflammation and infection (Gagnon and Rawson, 2010).

Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon spills (National Oceanic and Atmospheric Administration, 2010). Oiling can also irritate and injure skin, which is most evident on pliable areas such as the neck and flippers (Lutcavage et al., 1995). A stress response associated with this exposure pathway includes an increase in the production of white blood cells, and even a short exposure to hydrocarbons may affect the functioning of their salt gland (Lutcavage et al., 1995).

When first released, MDO has a higher toxicity due to the presence of the volatile components. Individual turtles making contact close to the spill source at the time of the spill may be impacted. Turtle presence is generally more concentrated in waters closer to shore, with infrequent presence of turtles as far offshore as the PAA. Although turtle presence may occur throughout the PAA and defined EMBA, it is unlikely that a large number of turtles will be affected at the sea surface above thresholds, as weathering predicts that only <1 to 15% of hydrocarbon remains on the surface after about seven days (RPS, 2019d).

With no shoreline exposure, there is negligible potential for impacts to turtle nesting beaches.

Impacts to sea snakes from direct contact with hydrocarbons are likely to result in similar physical effects to those recorded for marine turtles.

Potential impacts are unlikely to lead to mortality or sub-lethal injury/illness of an EPBC-listed protected species. Given hydrocarbon characteristics, expected rapid weathering to below impact thresholds, and the mobile transient nature of individuals, an unplanned release from a vessel collision is not expected to substantially modify, destroy or isolate an area of important habitat for migratory species. It is not expected that unplanned releases will have a substantial adverse effect on the population, or spatial distribution of marine reptiles; or seriously disrupt the lifecycle of an ecologically significant proportion of any migratory species.

Impacts to turtles from unplanned hydrocarbon releases are to be managed in accordance with the Recovery Plan for marine turtles in Australia (Commonwealth of Australia, 2017). The Recovery Plan identifies ensuring spill risk strategies and response programs include management for turtles and their habitats. In addition, there is in place approved Conservation Advice for the short-nosed sea snake (DSEWPaC, 2011), which includes ensuring there is no anthropogenic disturbance in areas where the species occurs, excluding necessary actions to manage the conservation of the species.

Based on the detailed risk evaluation, the magnitude of potential impacts to marine reptiles from unplanned hydrocarbon releases is assessed as no lasting effects (from change in fauna behaviour) and slight (from injury/mortality to fauna). Receptor sensitivity of marine reptiles is high (high value fauna), and therefore the overall consequence of a release of hydrocarbons on marine reptiles is Minor (D).

***Seabirds and Migratory Shorebirds***

A change in marine fauna behaviour or injury/mortality to seabirds and migratory shorebirds may occur due to a change in water following an unplanned hydrocarbon release.

Seabirds and migratory birds are particularly vulnerable to contact with floating hydrocarbons, which may mat feathers. This may lead to hypothermia from loss of insulation and ingestion of hydrocarbons when preening to remove hydrocarbons. Both impacts may result in mortality (Hassan and Javed, 2011). Pathways of biological exposure that can result in impact may occur through ingesting contaminated fish (nearshore waters) or invertebrates (intertidal foraging grounds such as beaches, mudflats and reefs). Ingestion can also lead to internal injury to sensitive membranes and organs (International Petroleum Industry Environmental Conservation Association, 2004). Whether the toxicity of ingested hydrocarbons is lethal or sub-lethal will depend on the weathering stage and its inherent toxicity. Exposure to hydrocarbons may have longer term effects, with impacts to population numbers due to decline in reproductive performance and malformed eggs and chicks, affecting survivorship and losing adult birds.

When first released, MDO has a higher toxicity due to the presence of the volatile components. Individual birds making contact close to the spill source at the time of the spill may be impacted. Bird presence within the NWMR is more concentrated in waters closer to shore with the potential for individual migratory birds within the PAA. Although bird presence may occur throughout the PAA and defined EMBA, it is unlikely that a large number of birds will be affected at the sea surface above thresholds as this is only predicted for the first five days.

No shoreline contact is predicted, therefore there is negligible likelihood of impact to significant nesting and / or roosting sites.

Although potential impacts could include mortality or sub-lethal injury/illness of birds, this would be expected to comprise a small proportion of the resident and transitory population. Given hydrocarbon characteristics, expected rapid weathering to below impact thresholds, and the mobile transient nature of individuals, an unplanned release from a vessel collision is not is not expected to substantially modify, destroy or isolate an area of important habitat for migratory species.

There are specific conservation advices for some species which identify habitat degradation as the key threat, but generally no explicit management actions are identified relating to hydrocarbon spills.

Based on the detailed risk evaluation, the magnitude of potential impact to seabirds and migratory shorebirds from unplanned hydrocarbon releases is assessed as having no lasting effects (from change in fauna behaviour) and slight (from injury/mortality to fauna). Receptor sensitivity of seabirds and migratory shorebirds is high (high value fauna), and therefore the overall consequence of a release of hydrocarbons on seabirds and migratory shorebirds is Minor (D).

***Key Ecological Features***

A change in habitat may occur due to a change in water or sediment quality that could impact KEFs.

The PAA intersects with the Exmouth Plateau KEF; and a further two KEFs have the potential to intersect with an unplanned release of hydrocarbons. The values and sensitivities of these KEFs relate to seafloor features, and demersal fish species (i.e. that live close to the seafloor). Therefore, water depth can determine whether any in-water hydrocarbons can potentially interact with these values and sensitivities.

As MDO typically remains in the top ~20 m of the water column and rapidly weathers, there is no potential for in-water hydrocarbons to intersect with the seafloor and demersal values.

- Exmouth Plateau KEF: intersects the PAA. Values and sensitivities are related to seafloor features. Receptors on the seafloor are not expected to be impacted by a surface release of hydrocarbons, given the water depths in the PAA (~930 m). However, these seafloor features may promote enhanced upwelling; potential impacts to plankton and fish are discussed above.
- Continental Slope Demersal Fish Communities KEF: intersects the EMBA (132 km south of the PAA). The KEF represents high levels of endemism of demersal fish species. Considering the minimum water depths of this KEF are 220–500 m and 750–1000 m, impacts to demersal fish are unlikely to occur. However, the values of the KEF may support higher order consumers, such as pelagic fish and shark species, impacts to which are discussed above.
- Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF: intersects the EMBA (116 km south-east of the PAA). The seafloor features of this KEF may promote enhanced upwelling and associated productivity, which is assessed above.

Given the weathering characteristics of MDO, exposure would be restricted to surface (including the upper water column); no interaction with benthic habitats in deep water areas is predicted. As such, there is unlikely to be adverse impact on marine ecosystem functioning or integrity.

Based on the assessment, the magnitude of a potential impact to KEFs associated with a release of hydrocarbons is no lasting effect. Receptor sensitivity of KEFs is high (high value), and therefore the consequence of a release of hydrocarbons on KEFs is slight (E).

***AMP's***

Spill modelling predicts that the Gascoyne AMP may be contacted by entrained hydrocarbons above the 100 ppb ecological impact threshold with a probability of 4%. The Gascoyne AMP contains marine fauna and biological communities, which are considered to be of important environmental value that the AMP is intended to protect. The values of the AMP have been evaluated in the sections above and it is determined that a spill is unlikely to result in significant impacts based on the nature of the spilled hydrocarbons.

Based on the assessment, the magnitude of a potential impact to the Gascoyne AMP associated with a release of hydrocarbons is slight. Receptor sensitivity of the AMP is high (high value), and therefore the consequence of a release of hydrocarbons on the AMP is Minor (D).

***Commonwealth and State Managed Fisheries***

A change in marine fauna behaviour or injury or mortality to marine fauna – in particular to commercially targeted species, or their prey species (e.g. plankton) – can impact fisheries.

Fish exposure to hydrocarbon can result in 'tainting' of their tissues. Even very low levels of hydrocarbons can impart a taint or 'off' flavour or smell in seafood. Tainting is reversible through the process of depuration which removes hydrocarbons from tissues by metabolic processes, although it depends on the magnitude of the contamination. Fish have a high capacity to metabolise these hydrocarbons while crustaceans (such as prawns) have a reduced ability (Yender et al., 2002). Seafood safety is a major concern associated with spill incidents. Therefore, actual or potential contamination of seafood can affect commercial and recreational fishing and can impact seafood markets long after any actual risk to seafood from a spill has subsided (Yender et al., 2002).

A major spill could result in the establishment of an exclusion zone around the spill affected area. There would be a temporary prohibition on fishing activities for a period and subsequent potential for economic impacts to affected commercial fishing operators. Additionally, hydrocarbon can foul fishing equipment such as traps and trawl nets, requiring cleaning or replacement.

MDO presence in the water would be restricted to the surface and upper water column only. Dissolved aromatics (i.e. the form that is bioavailable) are in such small concentrations in MDO that their effect in the marine environment is negligible; i.e. tainting from an MDO exposure is not considered likely to occur. Any exclusion zone established would be limited to the immediate vicinity of the release point, and due to the rapid weathering of MDO would only be in place days after release, therefore physical displacement to vessels is unlikely to be a significant impact.

While the PAA and EMBA overlap with a number of fishery management areas for commonwealth and state managed fisheries, Woodside considers there to be no potential for interaction given the current distribution of fishing effort for all fisheries identified is concentrated outside the PAA and EMBA. No significant impact from an MDO spill is therefore predicted.

Although potential impacts could include mortality or sub-lethal injury/illness of pelagic fish (described in the specific receptor evaluation), this would be expected to comprise a small proportion of the resident and transitory population. Given hydrocarbon characteristics, expected rapid weathering to below impact thresholds, and the offshore location of

the PAA and lack of fishing effort, an unplanned hydrocarbon spill from the Petroleum Activities Program is not expected to have an adverse effect on the sustainability of commercial fishing; or to interfere with other marine users.

Based on the detailed risk evaluation, the magnitude of potential impacts to Commonwealth and State managed fisheries from an unplanned hydrocarbon releases is assessed as having no lasting effect. Receptor sensitivity of commonwealth and state managed fisheries is high (high value marine user), and therefore the consequence of a release of hydrocarbons on commonwealth and state managed fisheries is Slight (E).

***Shipping***

In the event of a spill, an exclusion zone may be established around the spill affected area. This could result in exclusion of other users such as shipping vessels or vessels used by the mining and petroleum industries. Any exclusion zone established would be limited to the immediate vicinity of the release point, and due to the rapid weathering of MDO would only be in place for days after release, therefore physical displacement to vessels is unlikely to be a significant impact.

Given hydrocarbon characteristics, expected rapid weathering to below impact thresholds, short duration of displacement, and the offshore location of the PAA, unplanned releases of MDO are not expected to interfere with shipping to a greater extent than necessary.

Based on the assessment, the magnitude of a potential impact to shipping associated with an unplanned release of hydrocarbons is slight. Receptor sensitivity of shipping is medium (medium value user), and therefore the consequence of a release of hydrocarbons on shipping is Slight (E).

***Industry***

The proposed Equus Development Project is located about 70 km east of the PAA. No other facilities are located within the EMBA. In the event of a major spill, an exclusion zone may be established around the spill affected area. This could result in exclusion of other users such as vessels used by the mining and petroleum industries.

Any exclusion zone established would be limited to the immediate vicinity of the release point, and due to the rapid weathering of MDO would only be in place days after release, therefore physical displacement to vessels is unlikely to be a significant impact.

Given hydrocarbon characteristics, expected rapid weathering to below impact thresholds, and the offshore location of the PAA and distance to relevant industries, unplanned releases from Scarborough are not expected to interfere with other marine users than a greater extent than necessary.

Based on the assessment, the magnitude of a potential impact to industry associated with an unplanned release of hydrocarbons is slight. Receptor sensitivity of industry is medium (medium value user), and therefore the consequence of a release of hydrocarbons on industry is Slight (E).

***Cultural Heritage***

No listed World Heritage Places, Indigenous Sites of Significance, Commonwealth Heritage Places or National Heritage Places were identified in the EMBA. A search of the Australasian Underwater Cultural Heritage Database (**Section 4.9.2)** indicated that there are no underwater heritage sites or shipwrecks within the PAA or EMBA. Therefore, no impacts to heritage sites are expected. Refer to **Section 6.10** for cultural features and heritage assessment.

***Summary of Assessment Outcomes***

| Receptor | Impact | Receptor Sensitivity | Risk Consequence | Likelihood | Risk Rating |
|---|---|---|---|---|---|
| Water quality | Change in water quality | Low value (open water) | Negligible (F) | Highly Unlikely | Low |
| Plankton | Injury/ mortality to fauna | Low value (open water) | Negligible (F) | Highly Unlikely | Low |
| Fish | Change in fauna behaviour | High value species | Minor (D) | Highly Unlikely | Moderate |
| | Injury/mortality to fauna | High value species | Minor (D) | Highly Unlikely | Moderate |
| Marine mammals | Change in fauna behaviour | High value species | Minor (D) | Highly Unlikely | Moderate |
| | Injury/mortality to fauna | High value species | Minor (D) | Highly Unlikely | Moderate |
| Marine reptiles | Change in fauna behaviour | High value species | Slight (E) | Highly Unlikely | Low |

| ***Summary of Assessment Outcomes*** | | | | | |
|---|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity** | **Risk Consequence** | **Likelihood** | **Risk Rating** |
| | Injury/ mortality to fauna | High value species | Minor (D) | Highly Unlikely | Moderate |
| Seabirds and migratory shorebirds | Change in fauna behaviour | High value species | Slight (E) | Highly Unlikely | Low |
| | Injury/mortality to fauna | High value species | Minor (D) | Highly Unlikely | Moderate |
| AMP's | Change in habitat | High value habitat | Minor (D) | Highly Unlikely | Moderate |
| KEFs | Change in habitat | High value habitat | Slight (E) | Highly Unlikely | Low |
| Commonwealth and State managed fisheries | Changes to the functions, interests or activities of other users | High value marine user | Slight (E) | Highly Unlikely | Low |
| Shipping | Changes to the functions, interests or activities of other users | Medium value users | Slight (E) | Highly Unlikely | Low |
| Industry | Changes to the functions, interests or activities of other users | Medium value | Slight (E) | Highly Unlikely | Low |
| ***Overall Risk Consequence/Risk Rating:*** The overall risk rating for an unplanned hydrocarbon release resulting from a vessel collision is Moderate based on a Minor consequence, to the high value receptors (marine fauna, AMPs and KEFs), and a highly unlikely likelihood. The risk consequence/risk rating for individual receptors are consistent with the levels rated in the OPP. | | | | | |

**Table 6-15: Key receptor locations and sensitivities potentially contacted above impact thresholds by the vessel collision scenario with summary hydrocarbon spill contact (table cell values correspond to probability of contact [%])**

| Environmental setting | Location / name | Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure (WM0000PG10055394)) | | | | | | | | | | | | | | | | | | | | | | | | | | | Probability of hydrocarbon contact (diesel) (%) Note: the probability is based on stochastic modelling of 200 hypothetical worst-case spills under a variety of weather and metocean conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Physical | | Biological | | | | | | | | | | | | | | | | | | | | | Socio-economic and Cultural | | | | | Socio-cultural EMBA | | EMBA | | | |
| | | *Water Quality* | *Sediment Quality* | *Marine Primary Producers* | | | *Other Communities / Habitats* | | | | | | | *Protected Species* | | | | | | | | | *Other Species* | | *Fisheries – commercial* | *Fisheries – traditional* | *Tourism and Recreation* | *Protected Areas / Heritage – European and Indigenous / Shipwrecks* | *Offshore Oil and Gas Infrastructure (topside and subsea)* | Surface hydrocarbon (1–10 g/m²) | Accumulated hydrocarbons (10–100 g/m²) | Surface hydrocarbon (≥10 g/m²) | Entrained hydrocarbon (≥100 ppb) | Dissolved aromatic hydrocarbon (≥50 ppb) | Accumulated hydrocarbons (>100 g/m²) |
| | | *Open water – (pristine)* | *Marine Sediment – (pristine)* | *Coral reef* | *Seagrass beds / Macroalgae* | *Mangroves* | *Spawning/nursery areas* | *Open water – Productivity/upwelling* | *Non biogenic coral reefs* | *Offshore filter feeders and/or Deepwater benthic communities* | *Nearshore filter feeders* | *Sandy shores* | *Estuaries / tributaries / creeks / lagoons (including mudflats)* | *Rocky shores* | *Cetaceans – migratory whales* | *Cetaceans – dolphins and porpoises* | *Dugongs* | *Pinnipeds (sea lions and fur seals)* | *Marine turtles* | *Sea snakes* | *Whale sharks* | *Sharks and rays* | *Sea birds and/or migratory shorebirds* | *Pelagic fish populations* | *Resident /Demersal Fish* | | | | | | | | | | |
| *Offshore* | Gascoyne AMP | ✓ | ✓ | | | | | | | | | | | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | - | - | - | 4 | - | - |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Marine Order 30 (Prevention of Collisions) 2016, including:<br>• adherence to steering and sailing rules including maintaining look-outs (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar)<br>• adherence to navigation light display requirements, including visibility, light position/shape appropriate to activity<br>• adherence to navigation noise signals as required. | F: Yes.<br>CS: Minimal cost. Standard practice. | Legislative requirements to be followed reduce the likelihood of interference with other marine users resulting in a collision. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 8.1** |
| Marine Order 21 (Safety and emergency arrangements) 2016, including:<br>• adherence to minimum safe manning levels | F: Yes.<br>CS: Minimal cost. Standard practice. | Legislative requirements to be followed reduce the likelihood of interference with other marine users resulting in a collision. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 8.2** |
| Establishment of a 500 m petroleum safety zone around MODU and installation vessel and communicated to marine users. | F: Yes.<br>CS: Minimal cost. Standard practice. | Legislative requirements to be followed reduce the likelihood of a collision with a third-party vessel. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 4.2** |
| Arrangements supporting the activities in the OPEP (per **Table 7-9**) will be tested to ensure the OPEP can be implemented as planned. | F: Yes.<br>CS: Minimal cost. Standard practice. | Legislative requirement based on vessel class. Unlikely to have a significant reduction in consequence. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 8.3** |
| Marine Order 27 (safety of navigation and radio equipment) 2016:<br>• maintenance of navigation equipment in efficient working order (compass/radar)<br>• navigational system and equipment required are those specified in Regulation 19 of | F: Yes.<br>CS: Minimal cost. Standard practice. | Legislative requirements to be followed reduce the likelihood of interference with other marine users resulting in a collision. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 8.4** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Chapter V of Safety of Life at Sea<br>• Automatic Identification System that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data. | | | | |
| ***Good Practice*** | | | | |
| Support vessel on standby as required during drilling activities to assist in third-party vessel interactions.<br>When a support vessel is designated for standby it will undertake actions to prevent unplanned interactions, such as:<br>• maintain a 24-hour radio watch on designated radio channel(s)<br>• undertake continuous surveillance and warn the MODU/ installation vessel of any approaching vessels reaching 500 m petroleum safety zone. Surveillance shall be conducted by a combination of:<br>visual lookout<br>radar watch<br>other electronic systems available including Automatic Identification System (AIS)<br>monitoring any additional/ agreed radio communications channels<br>all other means available.<br>• While complying with the International Regulations for Preventing Collisions at Sea (COLREGS), approach any vessel attempting to transit through the 500 m zone and contact vessel by all available means. | F: Yes.<br>CS: Minimal cost – support vessels available routinely in PAA during Petroleum Activities Program. Standard practice. | Given the legislative controls in place, use of a support vessel, as defined in the One Marine Charterers Instructions, will provide a small reduction in likelihood of a collision with a third-party vessel. | Benefits outweigh cost/sacrifice. | Yes<br>**C 8.5** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| • Monitor and advise the MODU if:<br>– MODU navigation signals are defective.<br>– visibility becomes restricted.<br>– Any buoys in the area are not holding position or are not working as expected. | | | | |
| Notify Australian Hydrographic Office (AHO) of activities and movements will be notified no less than four working weeks prior to scheduled activity commencement date. | F: Yes.<br>CS: Minimal cost. Standard practice. | Notification of AHO will enable them to update maritime charts thereby reducing the likelihood of a collision with a third-party vessel. | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice. | Yes<br>**C 4.3** |
| Notify AMSA JRCC of activities and movements of the activity 24 to 48 hours before operations commence. | F: Yes.<br>CS: Minimal cost. Standard practice. | Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of a collision with a third-party vessel occurring | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice. | Yes<br>**C 4.5** |
| Develop a SIMOPS Plan to manage rig interactions with other facilities / vessels i.e. during xmas tree installation | F: Yes.<br>CS: Minimal cost. Standard practice. | SIMOPS Plan contains detail such as communications requirements, exclusion zones and entry/exit requirements and roles and responsibilities – which can help reduce likelihood of vessel collision. | Benefits outweigh cost/sacrifice.<br>Control is also Standard Practice. | Yes<br>**C 8.6** |
| **Mitigation: Oil spill response** | Refer to **Appendix D.** | | | |
| ***Professional Judgement – Eliminate*** | | | | |
| Eliminate use of vessels. | F: No. The use of vessels is required to conduct the Petroleum Activities Program.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| ***Professional Judgement – Substitute*** | | | | |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| No additional controls identified. | | | | |
| ***Risk Based Analysis*** | | | | |
| A quantitative spill risk assessment was undertaken (see detail above). | | | | |
| **ALARP Statement:**<br>On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the risks and consequences of an unplanned loss of hydrocarbon as a result of a vessel collision. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP. | | | | |

**Demonstration of Acceptability**

***Acceptability Criteria and Assessment***

Demonstration of acceptability for the sources of risk and associated impacts assessed in this section are provided in Section 7.2.6.4 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**

- Overall risk consequence/risk ratings for individual receptors are less than the significant impact level defined in the OPP.
- EPOs and controls in the OPP that are relevant to an unplanned hydrocarbon release from a vessel collision have been adopted.
- There are no changes to internal context specific to this risk from the OPP.
- Potential impacts from an unplanned hydrocarbon release, from a vessel collision, was raised during consultation (**Appendix F, Table 1**) and this feedback was considered in the finalisation of the EP.

***Acceptability Statement:***

The impact assessment has determined that an accidental hydrocarbon release as a result of a vessel collision represents a moderate current risk rating and is unlikely to result in a risk consequence greater than Minor. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. The adopted controls are considered consistent with industry legislation, codes and standards, good practice and professional judgement and meet the requirements and expectations of Australian Marine Orders, AMSA and AHO identified during impact assessment and consultation. The potential risks and consequences are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks and consequences of a loss of vessel structural integrity to a level that is broadly acceptable.

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 16**<br>No release of hydrocarbons to the marine environment due to a vessel collision associated with the | **C 8.1**<br>Marine Order 30 – Prevention of collisions – 2016, including:<br>• adherence to steering and sailing rules including maintaining | **PS 8.1**<br>Support vessels, installation vessel and MODU compliant with Marine Orders 30 (Prevention of Collisions) 2016 (which requires vessels to be | **MC 8.1.1**<br>Marine Assurance inspection records demonstrate compliance with standard maritime safety procedures (Marine Orders 21 and 30). |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| Petroleum Activities Program. | look-outs (e.g. visual, hearing, radar, etc), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar)<br>• adherence to navigation light display requirements, including visibility, light position/shape appropriate to activity<br>• adherence to navigation noise signals as required. | visible at all times) to prevent unplanned interaction with marine users. | |
| | **C 8.2**<br>Marine Orders 21 (Safety and emergency arrangements) 2016, including:<br>• adherence to minimum safe manning levels | **PS 8.2**<br>Support vessels, installation vessel and MODU compliant with Marine Orders Marine Orders 21 (Safety and emergency arrangements) 2016 to prevent unplanned interaction with marine users. | |
| | **C 4.2**<br>**See Section 6.7.4** | **PS 4.2**<br>**See Section 6.7.4** | **MC 4.2.1**<br>See **Section 6.7.4** |
| | | | **MC 4.2.2**<br>**See Section 6.7.4** |
| | **C 8.3**<br>Arrangements supporting the activities in the OPEP (per **Table 7-9**) will be tested to ensure the OPEP can be implemented as planned. | **PS 8.3.1**<br>Exercises/tests will be conducted in alignment with the frequency identified in **Table 7-12**. | **MC 8.3.1**<br>Testing of arrangement records confirm that emergency response capability has been maintained. |
| | | **PS 8.3.2**<br>Testing of arrangement records confirm that emergency response capability has been maintained. | **MC 8.3.2**<br>Emergency Management dashboard confirms that minimum level of personnel trained for core OPEP roles are available. |
| | **C 8.4**<br>Marine Order 27 (safety of navigation and radio equipment) 2016:<br>• maintenance of navigation equipment in efficient working order (compass/radar)<br>• navigational system and equipment required are those | **PS 8.4.1**<br>Support vessels, installation vessel and MODU compliant with Marine Orders Marine Orders 27 (Safety of navigation and radio equipment) 2016 to prevent unplanned interaction with marine users. | **MC 8.4.2**<br>Marine Assurance inspection records demonstrate compliance with standard maritime safety procedures (Marine Orders 27). |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | specified in Regulation 19 of Chapter V of Safety of Life at Sea<br>Automatic Identification System that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data. | | |
| | **C 8.5**<br>Support vessel on standby as required during drilling activities to assist in third-party vessel interactions. When a support vessel is designated for standby it will undertake actions to prevent unplanned interactions, such as:<br>• Maintain a 24-hour radio watch on designated radio channel(s)<br>• Perform continuous surveillance and warn the MODU/ installation vessel of any approaching vessels reaching 500 m petroleum safety zone. Surveillance shall be conducted by a combination of:<br>– visual lookout<br>– radar watch<br>– other electronic systems available including Automatic Identification System (AIS)<br>– monitoring any additional/agreed radio communications channels<br>– all other means available.<br>• While complying with the International Regulations for Preventing Collisions at Sea (COLREGS), approach any vessel | **PS 8.5**<br>Define role of support vessels in maintaining petroleum safety zone, preventing unplanned third-party vessel interactions, monitoring the effectiveness of navigation controls (e.g. signals), and warning third-party vessels of navigation hazards. | **MC 8.5.1**<br>Records of non-conformance against controls maintained. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | attempting to transit through the 500 m zone and contact vessel by all available means.<br>• Monitor and advise the MODU if:<br>– MODU navigation signals are defective<br>– visibility becomes restricted.<br>• Advise if any buoys in the area are not holding position or are not working as expected. | | |
| | **C 8.6**<br>SIMOPS Plan in place when MODU working in vicinity of other facilities / vessels i.e. during xmas tree installation.<br>SIMOPS Plan will contain information on:<br>• Minimum separation distances<br>• Communications<br>• MODU / vessels / activities involved in SIMOPS<br>• Exclusion zone entry and exit processes<br>• ROV operations<br>• Helicopter operations<br>• Key roles, responsibilities and emergency contacts<br>• PTW arrangements<br>• Incident reporting and investigation<br>• Management of Change | **PS 8.6**<br>MODU and applicable vessels compliant with SIMOPS Plan | **MC 8.6.1**<br>Up-to-date and approved SIMOPS Plan in place |
| | **C 4.3**<br>**See Section 6.7.4** | **PS 4.3**<br>**See Section 6.7.4** | **MC 4.3.1**<br>**See Section 6.7.4** |
| | **C 4.5**<br>**See Section 6.7.4** | **PS 4.5**<br>**See Section 6.7.4** | **MC 4.5.1**<br>**See Section 6.7.4** |
| | Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are presented in **Appendix D**. | | |

## 6.8.3 Unplanned Hydrocarbon Release: Loss of Well Control

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| Section 7.2.6 (Unplanned Hydrocarbon Release) | | |
| **Context** | | |
| **Relevant Activities**<br>Drilling Activities – **Section 3.8**<br>Contingency Activities – **Section 3.10** | **Existing Environment**<br>Physical Environment – **Section 4.2**<br>Habitats and Biological Communities – **Section 4.5**<br>Protected Species – **Section 4.6**<br>Protected Places – **Section 4.8**<br>Socio-economic Environment – **Section 4.9** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Unplanned loss of hydrocarbons during drilling operations | | | X | | | | | A | F | 1 | L | LCS<br>GP<br>PJ | Broadly acceptable | EPO 17 |

**Description of Source of Impact/Risk**

***Loss of hydrocarbons to marine environment during drilling***

A blowout is an incident where hydrocarbons from the formation flow out of the well or between formation layers after all the predefined technical well barriers (e.g. the BOP) or activation of the same have failed.

***Shallow hazards***

Shallow hazards (small pockets of subsurface gas not contained in the reservoir) may be present around well locations. Current well locations have been planned to avoid any potential shallow hazard zones, however there is a risk that the as-drilled geology is different to that which is expected. In the unlikely event that shallow hazards are unintentionally intersected whilst drilling, gas may evolve to the seabed. This could manifest as bubbles in the water column however would be unlikely to reach the sea surface given water depth, and would not reach the rig, having no conduit.

***Likelihood Assessment***

Woodside has a good history of implementing industry standard practice in well design and construction. In the Company's 60-year history, it has not experienced any well integrity events that have resulted in significant releases or significant environmental impacts.

The spill likelihood was evaluated using Blowout and Well release Frequencies based on SINTEF offshore blowout database 2012 (Scandpower, 2013). This uses data from 1991-2010 to determine likelihood for well blowouts and releases. For a gas well, the SINTEF calculated probability of blowout during drilling and completion is 2.93 X $10^{-4}$.

| Operation | Frequency, average well | Frequency, Gas well | Frequency Oil well |
|---|---|---|---|
| Development drilling, deep (normal wells) | 2.24 E-05 | 1.33E-05 | 3.34 E-05 |

| | | | |
|---|---|---|---|
| Completion | 1.85 E-04 | 2.83 E-04 | 8.72E-05 |
| **Total Per well** | 2.07 E-04 | 2.93 E-04 | 1.26 E-04 |

The SINTEF data supports a likelihood of 'Highly Unlikely' for a well blowout with potential to result in a spill as the dataset does not account for Woodside and Industry Process Safety Improvements post the Gulf of Mexico Macondo event and is therefore likely to be conservative. The SINTEF data set is January 1991 – December 2010, whilst the Macondo blowout occurred in April 2010. Significant strengthening of barriers is now in place post the data set period, including, but not limited to:

- Revised and more stringent API 53 Subsea BOP requirements in force.
- Competency assessments of offshore personnel is now more stringent for both Woodside and drilling contractors, for example through implementation of improvements to well control training as recommended by IOGP and requirements for Woodside personnel in safety critical roles to complete the Process Safety Management training requirements.
- Revision to Woodside barrier installation and verification process, including acceptance criteria and change control management.

The Scarborough Field is well appraised with a comprehensive set of measured reservoir pressure data from exploration and appraisal wells. The likelihood of encountering significant overpressure in the overburden section is minimised through in-field drilling experiences and pre-drill geohazard evaluations including seismic surveys and multiple in-field well data. This is believed another area of conservatism in the SINTEF likelihood data when applied to Scarborough.

When considering likelihood from an 'Experience' perspective a ranking of 'Has occurred many times in the industry' is considered too high when assessing the worst credible event of blowout with no pipe in hole, and no significant bridging or flow restriction through the BOP or other means. This is supported by SINTEF data, showing that none of the 17 blowouts analysed were open hole with no pipe in hole, whilst 28% had an annulus 'full flow' but the flow area is unknown (though it is unlikely to be as large as the open hole, no pipe in hole case).

***Drilling Timeframe***

Drilling is scheduled to occur throughout the year (all seasons) to provide operational flexibility for requirements and schedule changes and vessel/MODU availability.

***Credible Scenario – Loss of Well Control***

The Petroleum Activities Program consists of the drilling of up to ten development wells (two of which are contingency). A loss of well control could result in a loss of containment at any of these wells. A key difference between Scarborough and many other offshore developments is that the reservoirs contain no or only trace liquid hydrocarbons. Given that hydrocarbons of the Scarborough reservoir contain no measurable liquid fraction, in the event of a loss of containment there is expected to be no or negligible liquid component. This means there is no credible hydrocarbon spill scenario in the event of well blowout and as such, quantitative spill modelling has not been undertaken.

A loss of well control may escalate to major accident events. An ignited gas release could cause large scale fire and explosions topsides with significant equipment damage. This equipment damage may cause unplanned release of topsides chemical and hydrocarbon inventory, and potentially escalate to impact floating stability. In an extreme case, the MODU may founder, capsize and sink.

## Detailed Impact Assessment

***Assessment of Potential Impacts***

***Change in Water Quality***

A loss of well control may temporarily decrease the water quality in the immediate vicinity of the release.

The Scarborough reservoir properties are dry gas, primarily methane (approximately 95%) and nitrogen (approximately 4%), with some ethane, $CO_2$ content and limited heavier hydrocarbon components. Understanding of the Scarborough gas composition was supported by information collected from reservoir samples and well tests obtained from the Scarborough-4 and Scarborough-5 appraisal wells, and compositional analysis undertaken in 2018 and 2019. Analysis of worst case ("heaviest") reservoir composition indicates that no liquid hydrocarbons will exist at any pressure or temperature conditions that will be experienced in the environment. Liquid hydrocarbons are only expected at sub-zero temperatures which are not present in the marine environment at the location.

In the event of a loss of well control, the well will release gas at a worst-case discharge rate of 1.666 BSCFD/day of dry gas over 67 days. Hydrocarbons will be released from the well until one of the following interventions can be made:

- BOP intervention using ROV and hot stab;

- Capping stack; or
- a relief well is drilled with successful well kill.

In the event of a release of gaseous hydrocarbons from a loss of well control, the pressurised discharge will emit a jet of small gas bubbles with high momentum into the water column. The initial momentum of the jet would rapidly dissipate, and following the initial jet phase as the bubbles expand due to pressure reduction their buoyancy becomes the driving force for an upward plume of gas bubbles and entrained water.

As the gas travels upwards through the water column, dissolution will occur. Methane is moderately soluble in seawater, more so under higher pressure and colder temperature. Because of the deep water location, the majority of methane potentially released at seabed is expected to dissolve in the water column rather than reaching the surface.

The dissolved methane would biodegrade into non hydrocarbon products. Any gaseous methane would continue to rise to the sea surface and be transported away by surface winds.

Given the control measures in place to prevent a loss of well control event, and the offshore location of Scarborough and gas characteristics, the change to water quality resulting from unplanned hydrocarbon releases will be temporary and there is no pathway for impacts to habitat or ecosystem function or integrity.

Based on the risk evaluation, the magnitude of potential impact of a change in water quality from a loss of well control is assessed as slight. Receptor sensitivity of water quality is low (low value, open ocean), and therefore the consequence of a release of hydrocarbons on water quality is Negligible (F).

***Benthic communities and Sediment Quality***

Seabed disturbance would result in the event of the MODU sinking. The potential area that would be affected can conservatively be defined as MODU footprint plus 100 m in all directions, approximately 0.037 $km^2$. The benthic habitats and communities in the PAA are considered to be of low sensitivity and reflective of the wider NWMR. The physical disturbance to the seabed resulting from sinking of the MODU would be localised.

The MODU could act as a source of environmental contaminants due to material onboard the MODU (e.g. chemical / hydrocarbon inventories, corrosion of structural materials, debris etc.). The potential for contamination would diminish over time as the structure degrades. Depending on the nature of the loss of structural integrity, complete or partial salvage of the MODU may not be feasible. Any structures not able to be recovered would be left on the seabed indefinitely.

***Summary of Assessment Outcomes***

| Receptor | Impact | Receptor Sensitivity Level | Risk Consequence | Likelihood | Risk Rating |
|---|---|---|---|---|---|
| Water quality | Change in water quality | Low value (open water) | Negligible (F) | Highly Unlikely | Low |
| Sediment Quality | Change in sediment quality | Low value (open water) | Negligible (F) | Highly Unlikely | Low |
| Epifauna and Infauna | Injury/ mortality to fauna | Low value | Negligible (F) | Highly Unlikely | Low |
| KEFs | Change in habitat | High value habitat | Minor (D) | Highly Unlikely | Moderate |

***Overall Risk Consequence:*** The risk rating for an unplanned discharge from a loss of well control is Moderate based on a minor consequence to a high value receptor (KEF) and a highly unlikely likelihood. The risk consequence/risk rating for individual receptors are consistent with the levels rated in the OPP.

**Demonstration of ALARP**

| *Control Considered* | *Control Feasibility (F) and Cost/Sacrifice (CS)* | *Benefit in Impact/Risk Reduction* | *Proportionality* | *Control Adopted* |
|---|---|---|---|---|
| ***Legislation, Codes and Standards*** | | | | |
| Offshore Petroleum and Greenhouse Gas Storage (Resource Management and | F: Yes.<br>CS: Minimal cost. Standard practice. | Compliance with an accepted WOMP will ensure a number of barriers are in place and verified, reducing the likelihood of loss of well control occurring. Although | Benefits outweigh cost/sacrifice. | Yes<br>**C 9.1** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Administration) Regulations 2011: accepted WOMP, which describes the well design and barriers to be used to prevent a loss of well control. | | the consequence of a blowout would not be reduced, the reduction in likelihood reduces the overall risk. | | |
| As-built checks that shall be completed during well operations to establish a minimum acceptable standard of well integrity is achieved. | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduces the likelihood of occurrence. No reduction in consequence will occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 2.3** |
| Implement requirements for permanent well abandonment:<br>• well barrier as per the internal Woodside Standard and Procedure<br>• placement, length, material and verification of a permanent barrier. | F: Yes.<br>CS: Minimal cost. Standard practice. | This procedure will reduce the likelihood of a spill occurring from a suspended well. Although changes in consequence would occur, the reduction in likelihood results in a reduction in overall risk. | Benefits outweigh cost/sacrifice. | Yes<br>**C 9.2** |
| An approved Source Control Emergency Response Plan (SCERP) shall exist prior to drilling each well, including feasibility and any specific considerations for relief well kill. | F: Yes.<br>CS: Minimal cost. Standard practice. | The SCERP will describe the responses to a loss of well control including ROV intervention on BOP, use of capping stack to contain well, and the relief well. All of these responses are aimed at reducing the duration of the gas release, resulting in a reduction in consequence and overall risk. | Benefits outweigh cost/sacrifice. | Yes<br>**C 9.3** |
| ***Good Practice*** | | | | |
| Subsea BOP installed and tested during drilling operations. | F: Yes<br>CS: Standard practice. Required by Woodside standards. | Testing of the BOP will reduce the likelihood of a blowout resulting in release of hydrocarbons to the marine environment. In the event of a blowout, this control would not reduce the consequence, although the likelihood reduction reduces the overall risk ranking. | Benefits outweigh cost/sacrifice | Yes<br>**C 9.4** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Project-specific mooring design analysis. | F: Yes.<br>CS: Standard practice. Required by Woodside standards. | Ensure adequate MODU station holding capacity to prevent loss of station. This will reduce the likelihood of a blowout resulting in release of hydrocarbons to the marine environment. | Benefits outweigh cost/sacrifice. | Yes<br>**C 5.4** |
| ***Professional Judgement – Eliminate*** | | | | |
| Do not drill well. | F: No.<br>CS: Inability to produce hydrocarbons. Loss of the project. | All risk would be eliminated. | Disproportionate. Given the extremely low likelihood of a loss of well control due to the systematic implementation of Woodside's policies, standards, procedures and processes relating to drilling activities, the cost/sacrifice outweighs the benefit gained. | No |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| Implement slimmer well design to reduce blowout volumes. | F: No. Slim well design is not considered feasible based on the following factors:<br>• The well design is optimised to minimise the size of hole drilled while still being able to reach the targets and meet development objectives safely.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| **ALARP Statement:** | | | | |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the risks and consequences of an unlikely unplanned hydrocarbon release as a result of a loss of well control.<br>Woodside has completed further analysis of options for other activities with loss of well control events. The cost of applying this analysis to this Petroleum Activities Program is seen as grossly disproportionate because the event is risk rated as highly unlikely likelihood and moderate consequence. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.2.6.4 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**):<br>• Overall risk consequence/risk ratings for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to a loss of well control have been adopted.<br>• There are no changes to internal context specific to this risk from the OPP.<br>• Potential impacts from an unplanned hydrocarbon release, from the loss of well control, was raised during consultation (**Appendix F, Table 1**) and this feedback was considered in the finalisation of the EP. |
| **Acceptability Statement:**<br>The impact assessment has determined that an accidental hydrocarbon release resulting from a loss of well control represents a moderate current risk rating and is unlikely to result in a risk consequence greater than minor. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. The adopted controls are considered consistent with industry legislation, codes and standards, and industry good practice. Further opportunities to reduce the impacts have been investigated above.<br>The potential risks and consequences are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks and consequences of a loss of well control to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***Outcomes*** | ***Controls*** | ***Standards*** | ***Measurement Criteria*** |
| **EPO 17**<br>No loss of well control resulting in loss of hydrocarbons to the marine environment during Petroleum Activities Program | **C 9.1**<br>Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: (WOMP), which describes the well design and barriers to be used to prevent a loss of well control, which include:<br>• Blowout preventer (BOP) installation during drilling operations | **PS 9.1**<br>Wells drilled in compliance with the accepted WOMP, including implementation of barriers to prevent a loss of well control. | **MC 9.1.1**<br>Acceptance letter from NOPSEMA demonstrates the WOMP and application to drill were accepted by NOPSEMA prior to the drilling activity commencing.<br>**MC 9.1.2**<br>Records demonstrate minimum of two verified barriers (a single fluid barrier may be implemented during the initial stages of |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***Outcomes*** | ***Controls*** | ***Standards*** | ***Measurement Criteria*** |
| | • Regular testing of BOP | | well construction if appropriateness is confirmed by a shallow hazard study) were in place for all permeable zones penetrated by the wellbore. |
| | | | **MC 2.3.3**<br>Records demonstrate composition and weight of drilling fluids were applicable to down hole conditions. |
| | **C 2.3**<br>**See Section 6.7.2** | **PS 2.3.1**<br>**See Section 6.7.2** | **MC 2.3.1**<br>**See Section 6.7.2** |
| | | | **MC 2.3.2**<br>**See Section 6.7.2** |
| | **C 9.2**<br>Implement requirements for permanent well abandonment:<br>• well barrier as per the internal Woodside Standard and Procedure<br>• placement, length, material and verification of a permanent barrier | **PS 9.2**<br>Woodside abandons the wells according to internal Woodside Procedure. | **MC 9.2.1**<br>Records demonstrate Well Acceptance Criteria have been met |
| | **C 9.3**<br>An approved SCERP shall exist prior to drilling each well, including feasibility and any specific considerations for relief well kill. | **PS 9.3**<br>SCERP is in place to ensure feasibility of responding to a source control incident. | **MC 9.3**<br>An approved Source Control Emergency Response Plan |
| | **C 9.4**<br>Subsea BOP installed and tested during drilling operations. The BOP shall include:<br>• one annular preventer<br>• two pipe rams (excluding the test rams)<br>• a minimum of two sets of shear rams, one of which must be capable of sealing<br>• deadman functionality<br>• the capability of ROV intervention<br>• independent power systems. | **PS 9.4**<br>Subsea BOP specification, installation and testing compliant with internal Woodside Standards and international requirements (API Standard 53 5th Edition) as agreed by Woodside and MODU contractor. | **MC 9.4.1**<br>Records demonstrate that BOP and BOP control system specifications and testing were in accordance with minimum standards for the expected drilling conditions as agreed by Woodside and MODU contractor. |
| | **C 5.4**<br>**See Section 6.7.5** | **PS 5.4**<br>**See Section 6.7.5** | **MC 5.4.1**<br>**See Section 6.7.5** |

## 6.8.4 Unplanned Discharge: Chemicals and Hydrocarbons

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| OPP Section 7.2.1 Unplanned Discharge: Chemicals | | |
| **Context** | | |
| **Relevant Activities**<br>Drilling Activities – **Section 3.8**<br>Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1**<br>ROV Operations – **Section 3.9.4**<br>Contingency Activities – **Section 3.10** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Accidental discharge of hydrocarbons/ chemicals from MODU and project vessels deck activities and equipment, from subsea ROV hydraulic leaks | | | ✓ | | | ✓ | | A | E | 1 | L | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 18 |
| Accidental discharge of drilling fluids (WBM/ NWBM/ base oil) and cement to marine environment due to failure of slip joint packers, bulk transfer hose/fitting, emergency disconnect system or from routine MODU operations | | | ✓ | | | ✓ | | | | | | | | |

**Description of Source of Impact/Risk**

***Vessel, MODU and ROV Operations***

Deck spills can result from spills from stored hydrocarbons/chemicals or equipment. Project vessels typically store hydrocarbon/chemicals in various volumes (20 L, 205 L; up to approximately 4000–6000 L). Storage areas are typically set up with effective primary and secondary bunding to contain any deck spills. Releases from equipment are predominantly from the failure of hydraulic hoses, which can either be located within bunded areas or outside of bunded or deck areas (e.g. over water on cranes). Helicopter refuelling may also take place within the PAA, on the helipad of the MODU and project vessels.

Chemicals that will be used and may be accidentally released include:

- non process chemicals (maintenance and cleaning chemicals)
- non process hydrocarbons - i.e. hydraulic fluids used in machinery (including cranes, winches, ROVs), small volumes of fuel
- drilling and well fluids.

Non-Process Chemicals

Non-process chemicals, such as wash chemicals, cleaning chemicals, maintenance and solvents, are generally held onboard in low quantities (typically <50 L containers) and are located within chemical cabinets or bunded storage areas on the vessels and MODU. Non-process chemical spills may result from human error or damage to a chemical container during handling. Spills are generally captured by the drain system and routed to a holding tank for treatment or disposal onshore. In the event that a spill is not contained on deck or within a bunded area, there would be a release to the marine environment of up to 50 L.

Non-Process Hydrocarbons

Woodside's operational experience demonstrates that spills are most likely to originate from hydraulic hoses and have been less than 100 L, with an average volume <10 L.

Non-process hydrocarbons (hydraulic fluids) are used in hydraulic-powered machinery, such as winches, cranes and ROVs, and are hydrocarbon-based with added chemical component additives. Unplanned discharges are predominantly due to failure of hydraulic hoses or minor leaks from process components, or spills during periodic refuelling of hydraulic hoses. Spills or leaks from hydraulic hoses are usually very small volumes (~1 L) and are typically contained within a bunded or drained area under the equipment mounted on deck. These small on-deck spills are unlikely to reach the marine environment. A burst hydraulic hose on an extended crane could potentially result in hydraulic fluid being sprayed in a fine jet out over the water. However, this would only result in a small volume (~25 L) being released, due to the small capacity of hydraulic hoses.

Subsea spills can result from a loss of containment of fluids from subsea equipment including the BOP or ROVs. A review of these spills to the marine environment in the past 12 months showed subsea spills did not exceed approximately 26 L in Woodside's Drilling function.

The ROV hydraulic fluid is supplied through hoses containing approximately 20 L of fluid. Hydraulic lines to the ROV arms and other tooling may become caught resulting in minor leaks to the marine environment. Small volume hydraulic leaks may occur from equipment operating via hydraulic controls subsea (subsea control fluid).

Hydraulic fluids are medium oils of light to moderate viscosity. They have a relatively rapid spreading rate and will dissipate quickly, particularly in high sea states. Lubricating oils may also be held onboard, typically stored with the non process chemicals and held in low quantities. These hydrocarbons are more viscous, so in the event of an unplanned discharge, the spreading rate of a slick of these oils would be slightly slower.

***Drilling Fluids - Transfers***

A project vessel will undertake bulk transfer of mud or base oil to the MODU, if and when required. Failure of a transfer hose or fittings during a transfer or backload, as a result of an integrity or fatigue issue, could result in a spill of mud or base oil to either the bunded deck or into the marine environment.

The most likely spill volume of mud is likely to be less than 0.2 $m^3$ based on the volume of the transfer hose and the immediate shutoff of the pumps by personnel involved in the bulk transfer process. However, the worst-case credible spill scenario could result in up to 8 $m^3$ of mud being discharged. This scenario represents a complete failure of the bulk transfer hose combined with a failure to follow procedures requiring transfer activities to be monitored, coupled with a failure to immediately shut off pumps (e.g. mud pumped through a failed transfer hose for a period of about five minutes).

***Drilling Fluids - Slip Joint Packer Failure***

The slip joint packer enables compensation for the dynamic movement of the MODU (heave) in relation to the static location of the BOP. A partial or total failure of the slip joint packer could result in a loss of mud to the marine environment. The likely causes of this failure include a loss of pressure in the pneumatic (primary) system combined with loss of pressure in the back up (hydraulic) system.

Catastrophic sequential failure of both slip joint packers (pneumatic and hydraulic) would trigger the alarm and result in a loss of the volume of fluid above the slip joint (conservatively 1.5 $m^3$) plus the volume of fluid lost in the one minute (maximum) taken to shut down the pumps. At a flow rate of 1000 gallons per minute this volume would equate to an additional 3.8 $m^3$. In total, it is expected that this catastrophic failure would result in a loss of 5.3 $m^3$.

Failure of either of the slip joint packers at a rate not large enough to trigger the alarms could result in an undetected loss of 20 bbl (3 $m^3$) maximum assuming a loss rate of 10 bbl/hour and that MODU personnel would likely walk past the moon pool at least every two hours.

Loss of a drilling chemical container or drum during transfer from the supply vessel to the MODU may occur due to crane operator error or machinery failure. The maximum container that could be lost is an intermediate Bulk Container (IBC) which can hold 1 $m^3$ of chemicals. In the event that an IBC or drum is lost to the marine environment and cannot

be recovered the contents will discharge, either immediately or over a period depending on the damage to the drum or container.

***NWBM Drilling Fluid System***

The selection of a NWBM drilling fluid system (if required) will be based on Woodside processes; however, for the purposes of this risk assessment, an example base oil (Saraline 185V) has been used. Saraline 185V is a mixture of volatile to low volatility hydrocarbons. Predicted weathering of base oil, based on typical conditions in the region, indicates that about 50% by mass is predicted to evaporate over the first day or two (refer to **Table** ). At this time, most of the remainder could be entrained into the water column. In calm conditions, entrained hydrocarbons are likely to resurface with up to 100% able to evaporate over time.

**Table 6-16: Characteristics of the non water-based mud base oil**

| Oil type | Initial density (kg/m³) | Viscosity (cP @ 20 °C) | Volatiles (%) <180 | Semi volatiles (%) 180–265 | Low volatility (%) 265–380 | Residual (%) >380 | Aromatic (%) of whole oil <380 °C BP |
|---|---|---|---|---|---|---|---|
| | | | ***Non-Persistent*** | | ***Persistent*** | | |
| Base oil (Saraline 185V) | 0.7760 | 2.0 @ 40 °C | 8.5 | 41.1 | 50.4 | 0 | 0 |

All chemicals that may be released or discharged to the marine environment during the Petroleum Activities Program are assessed as per Woodside Chemical Selection and Assessment. This procedure is used to demonstrate that the potential impacts of the chemicals that may be released are acceptable and ALARP.

***Cement***

Bulk cement is transferred as powder from the supply vessel to the MODU prior to being mixed into a slurry in the cement unit. Additives are required to form a cement slurry; these are transferred to the MODU in drums from the supply vessel to the MODU. Unplanned discharge to the marine environment may occur due to crane operator error or machinery failure resulting in loss of a drum of cement additive, which cannot be recovered. Cement additives are typically stored in drums <100 litres.

***Contingency Activities***

Activation of the Emergency Disconnect Sequence

The EDS is an emergency system that provides a rapid means of shutting in the well (i.e. BOP closed) and disconnecting the MODU from the BOP. The EDS could be manually activated due to an identified threat to the safety of the MODU, including loss of MODU station keeping resulting from loss of multiple moorings, potential collision by a third-party vessel or a loss of well control. During operations, this could result in a subsurface release of a combination of WBM and/or NWBM and solids at the seabed and a release of base fluid. The volume of material released depends on the water depth and, hence, the length of the riser (i.e. the entire riser volume would be lost). The base oil of the NWBM would remain in an emulsion with the other components of the mud system. Approximately 103 $m^3$ of base oil could be released in the event of the riser being disconnected when drilling with NWBM.

Wireline Operations

Minor leaks during wireline activities with a live well are described to include leaks such as:

- leaks from the lubricator, stuffing box and hose or fitting failure, which are expected to be less than 10 L (0.01 $m^3$)
- loss of containment – fluids – surface holding tanks
- backloading of raw slop fluids in an IBC
- stuffing box leak/under pressure
- draining of lubricator contents
- excess grease/lubricant leaking from the grease injection head
- wind-blown lubricant dripping from cable/on deck
- lubricant used to lubricate hole.

Woodside's operational experience demonstrates that spills are most likely to originate from hydraulic hoses and have been less than 100 L, with an average volume less than 10 L.

| Detailed Impact Assessment |
|---|
| ***Assessment of Potential Impacts*** |
| ***Water Quality***<br>Change in Water Quality<br>Unplanned discharges of non-process chemicals and hydrocarbons may decrease the water quality in the immediate vicinity of the release. Only small volumes (<0.2 $m^3$) are anticipated, resulting in very short-term impacts to water quality, and limited to the immediate release location.<br>The worst-case drilling fluid or cement unplanned discharge is 8 $m^3$ which could occur during bulk transfer from the supply vessel to the MODU during drilling. These discharges would be to the sea surface and would rapidly dilute through mixing by surface currents and wave action.<br>Given the occasional nature of unplanned chemical discharge, the small volumes, and the offshore location of the PAA, the change to water quality resulting from unplanned discharge of chemicals will not be substantial.<br>Therefore the magnitude of any potential impact of a change in water quality is Slight. Receptor sensitivity of water quality is low (low value, open ocean), and therefore the consequence of a release of hydrocarbons/chemicals on water quality is Negligible (F).<br>***Marine Fauna***<br>Injury or Mortality to Marine Fauna<br>As a result of a change in water quality, further impacts to receptors may occur, which include injury or mortality to marine fauna resulting from exposure to toxins in the released chemicals/hydrocarbons. Given that surface discharges are rapidly dispersed, and subsea discharges (from ROVs) would be of very small volumes, potential impacts would be highly localised and temporary. The magnitude of potential impact to marine fauna is no lasting effect, which results in a consequence of Slight (E) based on the high receptor sensitivity. |

***Summary of Assessment Outcomes***

| Receptor | Impact | Receptor Sensitivity | Risk Consequence | Likelihood | Risk rating |
|---|---|---|---|---|---|
| Water quality | Change in water quality | Low value (open water) | Negligible (F) | Highly Unlikely | Low |
| Migratory Shorebirds and Seabirds | Injury/mortality to fauna | High value species | Slight (E) | Highly Unlikely | Low |
| Fish | | High value species | Slight (E) | Highly Unlikely | Low |
| Marine Mammals | | High value species | Slight (E) | Highly Unlikely | Low |
| Marine Reptiles | | High value species | Slight (E) | Highly Unlikely | Low |

***Overall Risk Consequence:*** The overall risk rating for unplanned discharge of chemicals is Low based on a Slight consequence, to a high value receptor (marine fauna), and a highly unlikely likelihood. The risk rating/risk consequence for individual receptors are consistent with the levels rated in the OPP.

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Marine Order 91 (Marine pollution prevention – oil) 2014, requires | F: Yes.<br>CS: Minimal cost. Standard practice. | By ensuring a SOPEP/SMPEP is in place for the vessel, the likelihood of a spill | Controls based on legislative requirements – must be adopted. | Yes<br>**C 6.4** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| SOPEP/SMPEP (as appropriate to vessel class). | | entering the marine environment is reduced. Although no significant reduction in consequence could result, the overall risk is reduced. | | |
| Where there is potential for loss of primary containment of oil and chemicals on the MODU, deck drainage must be collected via a closed drainage system. E.g. drill floor. | F: Yes.<br>CS: Minimal cost. Standard practice. | Requirements for deck drainage and management of oily water would reduce the likelihood of contaminated deck drainage water being discharged to the marine environment. No change in consequence would occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 6.3** |
| Marine riser's telescopic joint to be:<br>• comprised of a minimum of two packers (one hydraulic and one pneumatic)<br>• pressure tested in accordance with manufacturers recommendations. | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduces the likelihood of equipment failure leading to an unplanned release of drilling fluids. Although the consequence of an unplanned release would be reduced, the reduction in likelihood reduces the overall risk providing an overall environmental benefit. | Benefits outweigh cost/sacrifice. | Yes<br>**C 10.1** |
| Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily. | F: Yes.<br>CS: Minimal cost. Standard practice. | Implementation of procedures for chemical storage and handling on the MODU/Installation Vessel will reduce the consequence of impacts resulting from unplanned discharges to the marine environment by ensuring chemicals have been assessed for environmental acceptability. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 10.2** |
| ***Good Practice*** | | | | |
| Drilling, completions, cementing, and subsea control fluids and additives will have | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduces the consequence of impacts resulting from discharges to the | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.1** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| an environmental assessment completed prior to use. | | marine environment by ensuring chemicals have been assessed for environmental acceptability. Planned discharges are required for safely executing activities; therefore, no reduction in likelihood can occur. | | |
| Contractor procedure for managing drilling fluids transfers onto, around and off the MODU, which requires:<br>• emergency shutdown systems for stopping losses of containment (e.g. burst hoses)<br>• break-away dry-break couplings for oil-based mud hoses<br>• transfer hoses to have floatation devised to allow detection of a leak<br>• the valve line-up will be checked prior to commencing mud transfers<br>• constant monitoring of the transfer process<br>• direct radio communications<br>• completed PTW and JSA showing contractor procedures are implemented<br>• recording and verification of volumes moved to identify any losses<br>• mud pit dump valves locked closed when not in use for mud transfers and operated under a PTW. | F: Yes.<br>CS: Minimal cost. Standard practice for Woodside to review contractor systems prior to performing activity. | Reduces the likelihood of an unplanned release occurring. Although no change in consequence would occur, the reduction in likelihood decreases the overall risk, providing environmental benefit. | Benefits outweigh cost/sacrifice. | Yes<br>**C 10.8** |
| Check for the functionality of:<br>• additional SCE (augers and cuttings dryers)<br>• mud tanks<br>• mud tank room<br>• transfer hoses | F: Yes.<br>CS: Minimal cost. Standard practice | Reduces the likelihood of an event occurring and reduces the potential consequences (by limiting volume released). | Benefits outweigh cost/sacrifice. | Yes<br>**C 10.9** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| • NWBM base fluid transfer lines<br>• NWBM base fluid transfer station<br>• base fluid storage. | | | | |
| Spill kits positioned in high risk locations around the rig (near potential spill points such as transfer stations). | F: Yes.<br>CS: Minimal cost. Standard practice. | Spill kits would reduce the likelihood of a deck spill from entering the marine environment. The consequence is unchanged. | Benefits outweigh cost/sacrifice. | Yes<br>**C 10.10** |
| Installation vessels have self-containing hydraulic oil drip tray management system. | F: Yes.<br>CS: Minimal cost. Standard practice. | Requirements for self-containing hydraulic oil drip tray management system would reduce the likelihood of contaminants being discharged to the marine environment. No change in consequence would occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 10.11** |
| For drilling and completion fluids, chemical reviews are performed. | F: Yes.<br>CS: Minimal cost. Standard practice. | Regular reviews will ensure chemicals selected for drilling and completions fluids remain ALARP. | Benefits outweigh cost/sacrifice. | Yes<br>**C 7.2** |
| ***Professional Judgement - Eliminate*** | | | | |
| No additional controls identified | | | | |
| ***Professional Judgement – Substitute*** | | | | |
| Only use WBM during drilling. | F: Not feasible. While the base case is to use WBM, a contingent NWBM drilling fluid system is required for safety and technical reasons; therefore option to use must be maintained.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| ***Professional Judgement – Engineered Solution*** | | | | |
| Use a MODU which may have a larger tank storage capacity for WBM. As such, there would be fewer bulk transfer movements. | F: Not feasible. The use of a MODU with greater storage capacity cannot be confirmed. | Not considered – control not feasible. | Not considered – control not feasible. | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | CS: Significant cost and schedule delay would occur if the MODU was limited to greater storage capacity. | | | |
| Below-deck storage of all hydrocarbons and chemicals. | F: No. During operations there is a need to keep small volumes near activities and within equipment requiring use of hydrocarbons and chemicals and can result in increased risk of leaks from transfers via hose or smaller containers.<br>CS: Not considered – control not feasible. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| A reduction in the volumes of chemicals and hydrocarbons stored onboard MODU/vessels. | F: Yes. Increases the risks associated with transportation and lifting operations.<br>CS: Project delays if required chemicals not on board.<br>Increases the risks associated with transportation and lifting operations. | No reduction in likelihood or consequence since chemicals will still be required to enable drilling activities to occur. | Disproportionate. The cost/ sacrifice outweighs the benefit gained. | No |
| **ALARP Statement:**<br>On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the risks and consequences of an unplanned release of chemicals. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.2.1.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall risk consequence for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to an unplanned hydrocarbon release from bunkering have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:*** |

The impact assessment has determined that accidental discharge of chemicals represents a low current risk rating and is unlikely to result in a risk consequence greater than Slight. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. The adopted controls are considered consistent with industry legislation, codes and standards, good practice and professional judgement and meet the requirements and expectations of Australian Marine Orders identified during impact assessment.

The potential risks and consequences are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks and consequences of an unplanned discharge of chemicals /hydrocarbons to a level that is broadly acceptable.

| **Environmental Performance Outcomes, Standards and Measurement Criteria** | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 18**<br>Undertake the Petroleum Activities Program in a manner that will prevent an unplanned release of chemicals or non-process hydrocarbons to the marine environment resulting in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health. | **C 6.4**<br>**See Section 6.7.6** | **PS 6.4**<br>**See Section 6.7.6** | **MC 6.4**<br>**See Section 6.7.6** |
| | **C 6.3**<br>**See Section 6.7.6** | **PS 6.3**<br>**See Section 6.7.6** | **MC 6.3.1**<br>**See Section 6.7.6** |
| | **C 10.1**<br>Marine riser's telescopic joint to be:<br>• comprised of a minimum of two packers (one hydraulic and one pneumatic)<br>• pressure tested in accordance with manufacturer's recommendations. | **PS 10.1**<br>MODU's joint packer designed and maintained to reduce hydrocarbons discharged to the environment. | **MC 10.1.1**<br>Records demonstrate that MODU's joint packer is compliant. |
| | **C 10.2**<br>Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily. | **PS 10.2**<br>Failure of primary containment in storage areas does not result in loss to the marine environment. | **MC 10.2.1**<br>Records confirms all liquid chemicals and fuel are stored in bunded/secondarily contained areas when not being handled/moved temporarily. |
| | **C 7.1**<br>See **Section 6.7.7** | **PS 7.1**<br>See **Section 6.7.7** | **MC 7.1.1**<br>See **Section 6.7.7** |
| | **C 10.8**<br>Contractor procedure for managing drilling fluids transfers onto, around and off the MODU, which requires:<br>• emergency shutdown systems for stopping losses of containment (e.g. burst hoses)<br>• break-away dry-break couplings for oil-based mud hoses | **PS 10.8.1**<br>Compliance with Contractor procedures to limit accidental loss to the marine environment. | **MC 10.8.1**<br>Records demonstrate drilling fluid transfers are performed in accordance with the applicable contractor procedures. |
| | | **PS 10.9.1**<br>Prevents unacceptable use or discharge of NWBM/base oil. | **MC 10.9.1**<br>Records demonstrate the functionality of the specified equipment. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | • transfer hoses to have flotation devised to allow detection of a leak<br>• the valve line-up will be checked prior to commencing mud transfers<br>• constant monitoring of the transfer process<br>• direct radio communications<br>• completed PTW and JSA showing contractor procedures are implemented<br>• recording and verification of volumes moved to identify any losses<br>• mud pit dump valves locked closed when not in use for mud transfers and operated under a PTW.<br>**C 10.9**<br>Check for the functionality of:<br>• additional SCE (augers and cuttings dryers)<br>• mud tanks<br>• mud tank room<br>• transfer hoses<br>• NWBM base fluid transfer lines<br>• NWBM base fluid transfer station<br>• base fluid storage. | | |
| | **C 10.10**<br>Spill kits positioned in high risk locations around the rig (near potential spill points such as transfer stations). | **PS 10.10**<br>Spill kits to be available for use to clean up deck spills. | **MC 10.10.1**<br>Records confirms that spill kits are present, maintained, and suitably stocked. |
| | **C 10.11**<br>Installation vessels have self-containing hydraulic oil drip tray management system. | **PS 10.11**<br>To contain any on-deck spills of hydraulic oil. | **MC 10.11.1**<br>Records demonstrate project installation vessel is equipped with self-containing hydraulic oil drip tray management system. |
| | **C 7.2**<br>See **Section 6.7.7** | **PS 7.2.1**<br>See **Section 6.7.7** | **MC 7.2.1**<br>See **Section 6.7.7** |

## 6.8.5 Unplanned Discharge: Bunkering

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| OPP Section 7.2.1 Unplanned Discharge: Chemicals | | |
| **Context** | | |
| **Relevant Activities**<br>Vessel Operations – **Section 3.9.2**<br>MODU Operations – **Section 3.9.1** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Loss of hydrocarbons (diesel/jet fuel) to marine environment from bunkering/ refuelling | | | ✓ | | | ✓ | | A | D | 1 | M | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 18 |

**Description of Source of Impact/Risk**

***Diesel LOC from bunkering***

Bunkering of marine diesel between support vessels and the MODU as well as the possible refuelling of cranes, helicopters and other equipment may take place on the MODU.

Three credible scenarios for the loss of containment of marine diesel during bunkering operations have been identified:

- Partial or total failure of a bulk transfer hose or fittings during bunkering, due to operational stress or other integrity issues could spill marine diesel to the deck and/or into the marine environment. This would be in the order of less than 200 L, based on the likely volume of a bulk transfer hose (assuming a failure of the dry break and complete loss of hose volume).
- Partial or total failure of a bulk transfer hose or fittings during bunkering, combined with a failure in procedure to shutoff fuel pumps, for a period of up to five minutes, resulting in approximately 50 m3 marine diesel lost to the deck and/or into the marine environment.
- Partial or total failure of a bulk transfer hose or fittings during helicopter refuelling could spill aviation jet fuel to the helicopter deck and/or into the marine environment. All helicopter refuelling activities are closely supervised and leaks on the helideck are considered to be easily detectable. In the event of a leak, transfer would cease immediately. The credible volume of such a release during helicopter refuelling would be in the order of <100 L.

Given the limited volume of the potential release and offshore location no modelling has been undertaken as it is within significantly less than the 250 $m^3$ of MDO in **Section 6.8.2.**

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

A spill at the surface as a result of bunkering activities is likely to be localised with limited potential contact with sensitive receptor locations based on the modelling presented in **Section 6.7.2** for a larger spill (250 $m^3$), which predicted the spill to be restricted to open offshore waters.

| Detailed Impact Assessment |
|---|
| The potential biological and ecological impacts associated with much larger hydrocarbon spills are presented in **Section 6.7.2**; further detail on impacts specific to a spill of marine diesel from a bunkering loss are provided below.<br>The biological consequences of such a small volume spill on identified open water sensitive receptors relate to the potential for minor impacts to megafauna, plankton and fish populations (surface and water column biota) that are within the spill-affected area. No impacts to commercial fisheries are expected. Refer to **Section 6.7.2** (potential impacts of unplanned hydrocarbon release to the marine environment from vessel collision) for the detailed potential impacts. However, the extent of the EMBA associated with a marine diesel spill from loss during bunkering will be much reduced in terms of spatial and temporal scales, and hence, potential impacts from bunkering are considered slight. |

| ***Summary of Assessment Outcomes*** | | | | | |
|---|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity** | **Risk Consequence** | **Likelihood** | **Risk rating** |
| Water quality | Change in water quality | Low value (open water) | Negligible (F) | Highly Unlikely | Low |
| Migratory Shorebirds and Seabirds | Injury/mortality to fauna | High value species | Slight (E) | Highly Unlikely | Low |
| Fish | | High value species | Minor (D) | Highly Unlikely | Moderate |
| Marine Mammals | | High value species | Minor (D) | Highly Unlikely | Moderate |
| Marine Reptiles | | High value species | Minor (D) | Highly Unlikely | Moderate |
| ***Overall Risk Rating:*** The overall risk rating for unplanned discharge of hydrocarbons during bunkering is Moderate based on a minor risk consequence to the high value receptors (marine fauna) and a highly unlikely likelihood. The risk consequence/risk rating for individual receptors are consistent with the levels rated in the OPP. | | | | | |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Marine Order 91 (Marine pollution prevention – oil) 2014, requires SOPEP/SMPEP (as appropriate to vessel class). | F: Yes.<br>CS: Minimal cost. Standard practice. | By ensuring a SOPEP/SMPEP is in place for the vessel, the likelihood of a spill entering the marine environment is reduced. Although no significant reduction in consequence could result, the overall risk is reduced. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 6.4** |
| The Australian Government Civil Aviation Safety Authority CAAP 92-4(0) 'Guidelines for the development and operation of off-shore helicopter landing sites, including vessels'. | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduced the likelihood of an unplanned release during helicopter operations. The consequence is unchanged. | Controls based on legislative requirements – must be adopted. | Yes<br>**C 10.3** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Good Practice*** | | | | |
| Bunkering equipment controls:<br>• All hoses that have a potential environmental risk following damage or failure shall be placed on a hose register that is linked to the MODU's preventative maintenance system.<br>• All bulk transfer hoses shall be pressure-rated at purchase to reduce the risk of accidental hydrocarbon release during bunkering.<br>• There shall be dry-break couplings and flotation on fuel hoses.<br>• There shall be an adequate number of appropriately stocked, located and maintained spill kits. | F: Yes.<br>CS: Minimal cost. Standard practice. | By ensuring the appropriate equipment is in place, tested and maintained appropriately, the likelihood of a spill occurring is reduced. Although no significant reduction in consequence could result, the overall risk is reduced. | Benefits outweigh cost/sacrifice | Yes<br>**C 10.4** |
| Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including:<br>• A completed PTW and/or JSA shall be implemented for the hydrocarbon bunkering/refuelling operation.<br>• Visually monitoring of gauges, hoses, fittings and the sea surface during the operation.<br>• Hoses will be checked before starting.<br>• Bunkering/refuelling will commence in daylight hours. If the transfer is to continue into darkness, the JSA risk assessment must consider lighting and the ability to determine if a spill has occurred.<br>• Hydrocarbons shall not be transferred in marginal weather conditions. | F: Yes.<br>CS: Minimal cost. Standard practice. | By ensuring the appropriate equipment is in place, tested and maintained appropriately, the likelihood of a spill occurring is reduced. Although no significant reduction in consequence could result, the overall risk is reduced. | Benefits outweigh cost/sacrifice. | Yes<br>**C 10.5** |
| **Mitigation:** Oil spill response. | Refer to **Appendix D**. | | | |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Professional Judgement - Eliminate*** | | | | |
| No refuelling of helicopter on MODU. | F: No. Given the distance of the Petroleum Permit from the airports suitable for helicopter operations, and the endurance of available helicopters, eliminating helicopter refuelling is not feasible. Helicopter flights cannot be eliminated and may be required in emergency situations.<br>CS: Not assessed, control cannot feasibly be implemented. | Not considered – control not feasible. | Not considered – control not feasible. | No |
| The MODU/installation vessel brought into port to refuel. | F: No. Does not eliminate the fuel transfer risk.<br>It is not operationally practical to transit MODU back to port for refuelling based on the frequency of the refuelling requirements and distance from the nearest port.<br>CS: Significant due to schedule delay and vessel transit costs and day rates. | Eliminates the risk in the Permit Area, However, moves risk to another location. Therefore, no overall benefit. | Disproportionate. The cost/sacrifice outweighs the benefit gained. | No |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| No additional controls identified | | | | |

**ALARP Statement:**

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.2.3**), Woodside considers the adopted controls appropriate to manage the risks and consequences of an unplanned release of chemicals. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.2.1.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall risk consequence/risk ratings for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to an unplanned hydrocarbon release from bunkering have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:***<br>The impact assessment has determined that accidental discharge of hydrocarbons as a result of bunkering failure represents a moderate current risk rating and is unlikely to result in a risk consequence greater than Minor. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. The adopted controls are considered consistent with industry legislation, codes and standards, good practice and professional judgement and meet the requirements and expectations of Australian Marine Orders.<br>The potential risks and consequences are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of a loss of hydrocarbons during bunkering / refuelling to a level that is broadly acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 18**<br>Undertake the Petroleum Activities Program in a manner that will prevent an unplanned release of chemicals or non-process hydrocarbons to the marine environment resulting in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health. | **C 6.4**<br>See **Section 6.7.6** | **PS 6.4**<br>See **Section 6.7.6** | **MC 6.4**<br>See **Section 6.7.6** |
| | **C 10.3**<br>Helicopter fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily in accordance with the Australian Government Civil Aviation Safety Authority CAAP 92-4(0) 'Guidelines for the development and operation of off-shore helicopter landing sites, including vessels'. | **PS 10.3**<br>Failure of primary containment in storage areas does not result in loss to the marine environment. | **MC 10.3.1**<br>Records confirms all liquid chemicals and fuel are stored in bunded/secondarily contained areas when not being handled/moved temporarily. |
| | **C 10.4**<br>Bunkering equipment controls:<br>• All hoses that have a potential environmental risk following damage or failure shall be placed on the MODU's preventative maintenance system. | **PS 10.4.1**<br>To ensure damaged equipment is replaced prior to failure. | **MC 10.4.1**<br>Records confirm the MODU bunkering equipment is subject to systematic integrity checks. |
| | | **PS 10.4.2**<br>All diesel transfer hoses to have dry break couplings and pressure rating suitable for intended use. | **MC 10.4.2**<br>Records confirm presence of dry break of couplings and flotation on fuel hoses. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | • All bulk transfer hoses shall be pressure-tested at purchase to reduce the risk of accidental hydrocarbon release during bunkering.<br>• There shall be dry-break couplings and flotation on fuel hoses.<br>• There shall be an adequate number of appropriately stocked, located and maintained spill kits. | **PS 10.4.3**<br>To ensure adequate resources are available to allow implementation of SOPEP. | **MC 10.4.3**<br>Records confirm presence of spill kits. |
| | **C 10.5**<br>Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including:<br>• A completed PTW and/or JSA shall be implemented for the hydrocarbon bunkering/refuelling operation.<br>• Visual monitoring of gauges, hoses, fittings and the sea surface during the operation.<br>• Hose checks prior to commencement.<br>• Bunkering/refuelling will commence in daylight hours. If the transfer is to continue into darkness, the JSA risk assessment must consider lighting and the ability to determine if a spill has occurred.<br>• Hydrocarbons shall not be transferred in marginal weather conditions. | **PS 10.5**<br>Compliance with Contractor procedures for the management of bunkering/helicopter operations. | **MC 10.5.1**<br>Records demonstrate bunkering/refuelling undertaken in accordance with contractor bunkering procedures. |
| Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are presented in **Appendix D**. | | | |

## 6.8.6 Unplanned Discharge: Hazardous and Non – Hazardous Solid Waste/Equipment

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| OPP Section 7.2.2 Unplanned Discharge: Solid Waste | | |
| **Context** | | |
| **Relevant Activities**<br>MODU Operations – **Section 3.9.1**<br>Vessel Operations – **Section 3.9.2** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Accidental loss of hazardous or non-hazardous solid wastes / equipment to the marine environment | | | ✓ | | | ✓ | | A | D | 0 | L | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 2, 3, 4, 8, 11, 19, 20, 21 |

**Description of Source of Impact/Risk**

The MODU and project vessels will generate a variety of solid wastes, including packaging and domestic wastes such as aluminium cans, bottles, paper and cardboard. Hence, there is the potential for solid wastes to be lost overboard to the marine environment.

Equipment may also be accidentally lost overboard. Equipment that has been recorded as being lost on previous campaigns has primarily been windblown or dropped overboard and has included things such as personal protective equipment and small tools or materials.

These events have occurred during backloading activities, periods of adverse weather and incorrect waste storage.

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

The potential impacts of hazardous or non-hazardous solid waste / equipment accidentally discharged to the marine environment include contamination of the environment as well as secondary impacts relating to potential contact of marine fauna with wastes. This could result in entanglement or ingestion and lead to injury and death of individual animals and changes to aesthetic values. The temporary or permanent loss of waste materials into the marine environment is not likely to have a significant environmental impact, based on the location of the PAA, the types, size and frequency of wastes that could occur, and species present.

***Water Quality***

Change in Water Quality

Hazardous solid wastes such as paint cans, oily rags, etc., can cause localised contamination of the water through a release of toxins and chemicals. The level of impact to water quality will depend on the nature of the discharge, however volumes of the hazardous components are generally low (such as residual paint in cans or oily rags). Modelling of small volumes of hydrocarbons such as this (e.g., Shell, 2010) indicate rapid dilution in the offshore marine environment, with impacts limited to the immediate vicinity of the contamination.

Given likely small volumes, and the occasional nature of the event, these would result in temporary and highly localised changes to the water quality.

Based on the detailed risk evaluation, the magnitude of potential impact of a change in water quality is slight. Receptor sensitivity is low for water quality, leading to a Negligible (F) consequence.

***Seabirds and Migratory Shorebirds, Fish, Marine Reptiles and Marine Mammals***

Injury/Mortality to Fauna

The unplanned discharge of solid wastes can result in mortality to fauna, either through contamination or physical injury depending on the nature of the waste. Marine fauna, including fish, seabirds and shorebirds, marine mammals and marine reptiles may be impacted through ingestion or entanglement of waste or through exposure to toxic chemicals. Ingestion or entanglement of marine fauna has the potential for physical harm which may limit feeding/foraging behaviours and thus can result in mortalities. Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris was listed as a key threatening process under the EPBC Act in August 2003 (DoEE, 2018). The Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE, 2018) identifies EPBC Act-listed species for which there are scientifically documented adverse impacts resulting from marine debris. Marine turtles and seabirds in particular may be at risk from plastics which may cause entanglement or be mistaken for food (e.g. DoEE, 2018; DoEE, 2017) and ingested causing damage to internal tissues and potentially preventing feeding activities. In the worst instance this could have a lethal affect to an individual. Marine debris has been identified as threat in the Recovery Plan for Marine Turtles in Australia (2017–2027).

Impacts to species including fish, birds, marine mammals and marine reptiles from the unplanned discharge of solid waste is unlikely given low occurrence of unplanned discharges and the location of the activities at significant distance from sensitive habitats. Significant impacts are unlikely to occur at an individual level and will not occur at a population level, nor result in the decrease of the quality of the habitat such that the extent of these species is likely to decline.

While the threat abatement plan for impacts of marine debris on vertebrate marine life does not list explicit management actions for non-related industries (DEWHA, 2009), management controls will reduce the risk of unplanned discharge of solid waste.

The magnitude of potential impact to marine fauna is Slight, which results in a consequence of Minor (D) based on the high receptor sensitivity.

| ***Summary of Assessment Outcomes*** | | | | | |
|---|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity** | **Risk Consequence** | **Likelihood** | **Risk Rating** |
| Water Quality | Change in water quality | Low value (open water) | Negligible (F) | Remote | Low |
| Migratory Shorebirds and Seabirds | Injury/mortality to fauna | High value species | Minor (D) | Remote | Low |
| Fish | | High value species | Minor (D) | Remote | Low |
| Marine Mammals | | High value species | Minor (D) | Remote | Low |
| Marine Reptiles | | High value species | Minor (D) | Remote | Low |
| ***Overall Risk Consequence:*** The overall risk rating for unplanned discharge of hazardous and non-hazardous solid waste is Low based on a Minor consequence, to the high value receptors (marine fauna), and a remote likelihood. The risk consequence levels/risk ratings for individual receptors are consistent with the levels rated in the OPP. | | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Marine Order 95 – Pollution prevention – Garbage (as appropriate to vessel class), which requires putrescible | F: Yes.<br>CS: Minimal cost. Standard practice. | Legislative requirements to be followed reduce the likelihood of an | Controls based on legislative requirements – must be adopted. | Yes<br>**C 6.2** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| waste and food scraps are passed through a macerator so that it is capable of passing through a screen with no opening wider than 25 mm. | | unplanned release. The consequence is unchanged. | | |
| ***Good Practice*** | | | | |
| Drilling and Completions Waste Management Plan, which requires:<br>• dedicated space for waste segregation bins and skips provided on the MODU<br>• records of all waste to be disposed, treated or recycled<br>• waste streams handled and managed according to their hazard and recyclability class<br>• all non-putrescible waste (excludes all food, greywater or sewage waste) to be transported from the MODU and disposed of onshore. | F: Yes.<br>CS: Minimal cost. Standard practice. | Controls outlined in the management plan will reduce the likelihood of an unplanned release. The consequence is unchanged. | Benefit outweighs cost sacrifice. | Yes<br>**C 11.2** |
| Installation vessel waste arrangements, which require:<br>• dedicated waste segregation bins<br>• records of all waste to be disposed, treated or recycled<br>• waste streams to be handled and managed according to their hazard and recyclability class. | F: Yes.<br>CS: Minimal cost. Standard practice. | Controls will reduce the likelihood of an unplanned release. The consequence is unchanged. | Benefit outweighs cost sacrifice. | Yes<br>**C 11.3** |
| MODU/Project vessel ROV, crane or project vessel may be used to attempt recovery of solid wastes /equipment lost overboard.<br>Where safe and practicable for this activity will consider:<br>• risk to personnel to retrieve object<br>• whether the location of the object is in | F: Yes.<br>CS: Minimal cost. Standard practice. | Occurs after an unplanned release of solid waste and therefore no change to the likelihood. Since the waste objects may be recovered, a reduction in consequence is possible. | Benefit outweighs cost sacrifice. | Yes<br>**C 11.4** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| recoverable water depths<br>• object's proximity to subsea infrastructure<br>• ability to recover the object (i.e. nature of object, lifting equipment or, ROV availability and suitable weather).<br>Any material dropped objects / waste that remain in the title will undergo an impact assessment and be added to the inventory. | | | | |
| ***Professional Judgement – Eliminate*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| No additional controls identified. | | | | |
| **ALARP Statement:**<br>On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.2**), Woodside considers the adopted controls appropriate to manage the risks and consequences of accidental loss of hazardous or non-hazardous solid wastes / equipment to the marine environment. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.2.2.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)**:**<br>• Overall risk consequence/risk ratings for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to an unplanned release of hazardous and non-hazardous wastes have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:***<br>The impact assessment has determined that unplanned discharges from a release of solid hazardous and non-hazardous wastes / equipment represents a low current risk rating and is unlikely to result in a risk consequence greater than Minor. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. The adopted controls are considered consistent with industry legislation, codes and standards, good practice and professional judgement and meet the requirements of Australian Marine Orders identified during impact assessment.<br>Further opportunities to reduce the impacts have been investigated above. |

| Demonstration of Acceptability |
|---|
| Based on an assessment against the defined acceptable levels, the risk from unplanned discharges of solid waste / equipment is considered acceptable. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 2**<br>Undertake the Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of seabirds or shorebirds, or the spatial distribution of the population.<br>**EPO 3**<br>Undertake the Petroleum Activities Program in a manner that will not seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.<br>**EPO 4**<br>Undertake the Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of marine reptiles or the spatial distribution of the population.<br>**EPO 8**<br>Undertake the Petroleum Activities Program in a manner that will not substantially modify, destroy or isolate an area of important habitat for a migratory species.<br>**EPO 11**<br>Undertake the Petroleum Activities Program in a manner that will prevent a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health. | **C 6.2**<br>See **Section 6.7.6** | **PS 6.2**<br>See **Section 6.7.6** | **MC 6.2.1**<br>See **Section 6.7.6** |
| | **C 11.2**<br>Drilling and Completions Waste Management Plan, which requires:<br>• dedicated space for waste segregation bins and skips shall be provided on the MODU.<br>• records of all waste to be disposed, treated or recycled.<br>• waste streams to be handled and managed according to their hazard and recyclability class.<br>• all non-putrescible waste (excludes all food, greywater or sewage waste) to be transported from the MODU and disposed of onshore<br>• CM15: implementation of waste management procedures which provide for safe handling and transportation, segregation and storage and appropriate classification of all waste generated. | **PS 11.2**<br>Hazardous and non-hazardous waste will be managed in accordance with the Drilling and Completions Waste Management Plan. | **MC 11.2.1**<br>Records demonstrate compliance against Drilling and Completions Waste Management Plan. |
| | **C 11.3**<br>Installation Vessel waste management arrangements, which require:<br>• dedicated waste segregation bins<br>• records of all waste to be disposed, treated or recycled | **PS 11.3**<br>Hazardous and non-hazardous waste will be managed in accordance with the Installation vessel waste management arrangements. | **MC 11.3.1**<br>Records demonstrate compliance against Installation Vessel waste management arrangements. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 19**<br>Undertake the Petroleum Activities Program in a manner that will prevent an unplanned release of solid waste to the marine environment resulting in a significant impact.<br>**EPO 20**<br>Undertake the Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of fish, or the spatial distribution of the population.<br>**EPO 21**<br>Undertake the Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of marine mammals or the spatial distribution of the population. | • waste streams to be handled and managed according to their hazard and recyclability class<br>• implementation of waste management procedures which provide for safe handling and transportation, segregation and storage and appropriate classification of all waste generated. | | |
| | **C 11.4**<br>MODU/Project vessel ROV, crane or project vessel may be used to attempt recovery of solid wastes /equipment lost overboard.<br>Where safe and practicable for this activity will consider:<br>• risk to personnel to retrieve object<br>• whether the location of the object is in recoverable water depths<br>• object's proximity to subsea infrastructure<br>• ability to recover the object (i.e. nature of object, lifting equipment or, ROV availability and suitable weather).<br>Any material dropped objects / waste that remain in the title will undergo an impact assessment and be added to the inventory. | **PS 11.4**<br>Any solid waste /equipment dropped to the marine environment will be recovered where safe and practicable to do so.<br>Where retrieval is not practicable and / or safe, material items (property) that are lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title. | **MC 11.4.1**<br>Records detail the recovery attempt consideration and status of any waste /equipment lost to marine environment.<br>**MC 11.4.2**<br>First Priority records demonstrate outcomes of the safe and practicable evaluation including an impact assessment for the objects remaining.<br>**MC 11.4.3**<br>Records demonstrate that material items left in title are added to the inventory. |

## 6.8.7 Physical Presence (Unplanned): Seabed Disturbance

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| OPP Section 7.2.3 Physical Presence (Unplanned): Seabed Disturbance | | |
| **Context** | | |
| **Relevant Activities**<br>MODU Operations – **Section 3.9.1**<br>Vessel Operations – **Section 3.9.2** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Dropped objects resulting in the disturbance of benthic habitat | | ✓ | | | ✓ | | | A | D | 1 | M | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 13, 22 |
| Failed MODU mooring leading to anchor drag and the disturbance of benthic habitat | | ✓ | | | ✓ | | | | | | | | | |

**Description of Source of Impact/Risk**

During MODU and project vessel operations, the primary cause for unplanned seabed disturbance is through dropped objects from the MODU or project vessels. Additional unplanned disturbance to the seabed may occur from mooring failure and subsequent anchor drag during MODU operations if a moored MODU is used for the Petroleum Activities Program.

***Dropped Objects***

There is the potential for objects to be dropped overboard from the MODU and project vessels to the marine environment. Objects that have been dropped during previous offshore activities include small numbers of personal protective gear (e.g. glasses, gloves, hard hats), small tools (e.g. spanners) hardware fixtures (e.g. riser hose clamp) and drill equipment (e.g. drill pipe); however, there is also potential for larger equipment to also be dropped during the activity, particularly during recovery of infrastructure from the seabed. The spatial extent in which dropped objects can occur is restricted to the PAA.

***Anchor Drag***

During drilling, the MODU will be secured on station by mooring lines (if a moored MODU is used), which are held in place by anchors deployed to the seabed. High energy weather events such as cyclones, occurring while the MODU is on station, can lead to excessive loads on the mooring lines, resulting in failure (either anchor(s) dragging or mooring lines parting). A failure of mooring integrity may lead to the mooring lines and anchors attached to the MODU being trailed across the seabed. If mooring failure is sufficient, the MODU may move off station, increasing the likelihood of anchor drag across the seafloor.

Industry statistics from the North Sea show that a single mooring line failure for MODUs is the most common failure mechanism ($33 \times 10^{-4}$ per line per year), followed by a double mooring line failure ($11 \times 10^{-4}$ per line per year) (Petroleumstilsynet, 2014). Note that single and double mooring line failures do not typically result in the loss of station keeping. If partial or complete mooring failures are sufficient to result in a loss of station keeping, industry

experience indicates that MODUs may drift considerable distances from their initial position (Offshore: Risk & Technology Consulting Inc., 2002). Partial mooring failures leading to a loss of station keeping resulted in smaller MODU displacements, due to the remaining anchors dragging along the seabed when compared to complete mooring failures; complete mooring failures resulted in a freely drifting MODU (Offshore: Risk & Technology Consulting Inc., 2002).

NOPSEMA has recorded four cases of anchor drag due to loss of MODU holding station during cyclone activity between 2004 and 2015 (NOPSEMA 2015). Seabed disturbance area size from anchor drag will depend on the extent of the drag.

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

In the unlikely event of an object being dropped into the marine environment or failed mooring, potential environmental effects would be limited to localised physical impacts on benthic communities. In most cases, objects will be able to be recovered and therefore these impacts will also be temporary in nature. However, there may be instances where objects are unable to be recovered due to health and safety, operational constraints or other factors such as the difficulty of recovering dropped objects at depth. When dropped objects are unable to be recovered, the impact will continue to be localised but would also be long-term.

***KEFs***

The temporary or permanent loss of dropped objects into the marine environment and mooring failure is likely to result in a localised impact only, as the benthic communities associated with the PAA are of low sensitivity and are broadly represented throughout the NWMR. As described in **Section 4.7**, the Exmouth Plateau KEF overlaps the PAA. Benthic communities in the PAA are representative of the Exmouth Plateau and of deep water soft sediment habitats reported in the wider region (e.g. BHP Billiton, 2004; Woodside, 2005; Woodside, 2006; Brewer et al., 2007; RPS, 2011; Woodside, 2013; Apache, 2013).

Given the nature and scale of risks and consequences from dropped objects and mooring failure, no lasting effect is expected to seabed sensitivities within the PAA. Further, considering the types, size and frequency of dropped objects that could occur, it is unlikely that a dropped object would have a significant impact on any benthic community.

Any unplanned seabed disturbance within the KEF would be highly localised and relatively small compared to the size of the KEF. There will be no substantial adverse effect on the KEF or the communities within it. On this basis, the magnitude of potential impacts to KEFs from unplanned seabed disturbance during activities is Slight. Receptor sensitivity for KEF is high, leading to a Minor (D) risk consequence.

***Epifauna and Infauna***

As a result of a change in water quality and change in habitat, injury or mortality to marine fauna resulting from an increase in turbidity may occur. Given a change to water quality is unlikely, the only receptors that would potentially be at risk of unplanned seabed disturbance are bottom dwelling species including epifauna and infauna. Benthic communities, including epifauna and infauna may be impacted by the dropped objects, or the drag of anchors on the seabed. If not recovered, dropped objects may result in the permanent loss of a small area under the object.

If anchor drag occurs, habitat impact will span the extent of the drag area, leading to a localised change in communities; however, substantial adverse effect is not anticipated, given the sparse marine life that are well represented elsewhere in the region.

Given generally sparse benthic communities in the PAA, no threatened or migratory species or ecological communities were identified, and those epifauna and infauna communities observed are likely to be well represented elsewhere in the region, impacts are expected to be restricted to a localised proportion of epifauna and infauna communities.

Based on the detailed evaluation, the magnitude of potential impacts to epifauna and infauna from unplanned seabed disturbance during activities associated with Scarborough is evaluated to be slight. Sensitivity for epifauna and infauna is low, leading to a Negligible (F) risk consequence.

***Summary of Assessment Outcomes***

| Receptor | Impact | Receptor sensitivity | Risk Consequence | Likelihood | Risk Rating |
|---|---|---|---|---|---|
| Epifauna and infauna | Change in habitat<br>Injury/ mortality to fauna | Low value | Negligible (F) | Highly Unlikely | Low |

| *Summary of Assessment Outcomes* | | | | | |
|---|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor sensitivity** | **Risk Consequence** | **Likelihood** | **Risk Rating** |
| KEFs | Change in habitat | High Value | Minor (D) | Highly Unlikely | Moderate |
| ***Overall Risk Consequence:*** The overall risk rating for disturbance to benthic habitat from unplanned seabed disturbance is Moderate based on minor consequence to the high value receptor (KEFs) and a highly unlikely likelihood. The risk consequence/risk ratings for individual receptors are consistent with the levels rated in the OPP. | | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| No additional controls identified. | | | | |
| ***Good Practice*** | | | | |
| The MODU/ installation vessel work procedures for lifts, bulk transfers and cargo loading, which require:<br>• The security of loads shall be checked prior to commencing lifts.<br>• Loads shall be covered if there is a risk of loss of loose materials.<br>• Lifting operations shall be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state. | F: Yes.<br>CS: Minimal cost. Standard practice. | Occurs after a dropped object event and therefore no change to the likelihood. Since the object may be recovered, a reduction in consequence is possible. | Benefits outweigh cost/sacrifice. | Yes<br>**C 12.1** |
| MODU/ installation vessel inductions include control measures for dropped object prevention. | F: Yes.<br>CS: Minimal cost. Standard practice. | By ensuring crew are appropriately trained in dropped object prevention, the likelihood of a dropped object event is reduced. No change in consequence will occur. | Benefits outweigh cost/sacrifice. | Yes<br>**C 12.2** |
| Specifications and requirements for station keeping equipment (mooring systems), require that:<br>• systems are tested and inspected in accordance with API RP 21<br>• systems have sufficient capability such that a failure of any single component will not | F: Yes.<br>CS: Minimal cost. Standard practice. | Reduces the likelihood of mooring failure leading to uncontrolled anchor drag. Should mooring failure occur, no significant reduction in consequence could occur. | Benefit outweighs cost sacrifice. | Yes<br>**C 12.3** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| cause progressive failure of the remaining anchoring arrangement. | | | | |
| ***Professional Judgement – Eliminate*** | | | | |
| Only use a DP MODU (no anchoring required) for all wells. | F: Yes.<br>CS: Restricting MODU selection to only DP capable rigs would introduce unacceptable additional costs and operational delays. Woodside has a demonstrated capacity to manage the environmental risks and impacts from mooring to a level that is ALARP and acceptable. | Application of control would eliminate the risk. | Disproportionate. The cost/sacrifice associated with only using a DP capable MODU outweighs the benefit gained. | No |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| MODU tracking equipment operational when the MODU unmanned. | F: Yes.<br>CS: Minimal cost. Standard practice. | Although no reduction in consequence would occur, the overall risk is reduced as the location of the MODU would be known at all times and response times could be improved in the event of a loss of station keeping. (E,1). | Benefit outweighs cost sacrifice. | Yes<br>**C 12.4** |
| ***Risk Based Analysis*** | | | | |
| Project-specific Mooring Design Analysis. | F: Yes.<br>CS: Minimal cost. Standard practice. | By ensuring that a mooring analysis report is undertaken, the likelihood of mooring failure occurring is reduced. Although no reduction in consequence would occur, the overall risk is reduced. | Benefit outweighs cost sacrifice. | Yes<br>**C 5.4** |
| Mooring system is tested to recommended tension as per API RP 2SK. | F: Yes.<br>CS: Minimal cost. Standard practice | Reduces the likelihood of anchor drag leading to seabed disturbance. | Benefit outweighs cost sacrifice. | Yes<br>**C 12.5** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |

**ALARP Statement:**

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the risks and consequences of unplanned seabed disturbance. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.2.3.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**)*:*<br>• Overall risk consequence/risk ratings for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to an unplanned seabed disturbance have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:***<br>The impact assessment has determined that disturbance to seabed from dropped objects or a loss of station keeping of the MODU represents a moderate current risk rating and is unlikely to result in a risk consequence greater than Minor. The adopted controls are considered industry good practice. The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of seabed disturbance from dropped objects / anchor drag to an acceptable level. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 13**<br>Undertake the Petroleum Activities Program in a manner which does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in an area defined as a Key Ecological Feature.<br><br>**EPO 22**<br>Undertake the Petroleum Activities Program in a manner which prevents unplanned seabed disturbance. | **C 12.1**<br>The MODU/ installation vessel work procedures for lifts, bulk transfers and cargo loading, which require:<br>• the security of loads shall be checked prior to commencing lifts<br>• loads shall be covered if there is a risk of loss of loose materials.<br>Lifting operations shall be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state. | **PS 12.1**<br>All lifts conducted in accordance with applicable MODU/ installation vessel work procedures to limit potential for dropped objects. | **MC 12.1.1**<br>Records show lifts conducted in accordance with the applicable MODU/ installation vessel work procedures. |

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | **C 12.2**<br>MODU/ installation vessel inductions include control measures for dropped object prevention. | **PS 12.2**<br>To ensure awareness of requirements for dropped object prevention. | **MC 12.2.1**<br>Records show dropped object prevention training is provided to the MODU/ installation vessel. |
| | **C 12.3**<br>Specification and requirements for station keeping equipment (mooring systems), require that:<br>• systems are tested and inspected in accordance with API RP 21<br>• systems have sufficient capability such that a failure of any single component will not cause progressive failure of the remaining anchoring arrangement. | **PS 12.3**<br>MODU mooring system tested and in place to ensure no complete mooring failure. | **MC 12.3.1**<br>Records demonstrate mooring system tests and inspection. |
| | **C 12.4**<br>Moored MODU tracking equipment operational when the MODU unmanned. | **PS 12.4**<br>Tracking of the MODU is possible when the MODU is unmanned. | **MC 12.4.1**<br>Records show the moored MODU has functional tracking equipment for instances when MODU is unmanned. |
| | **C 5.4**<br>See **Section 6.7.5** | **PS 5.4.1**<br>See **Section 6.7.5** | **MC 5.4.1**<br>See **Section 6.7.5** |
| | **C 12.5**<br>Mooring system is tested to recommended tension as per API RP 2SK | **PS 12.5**<br>Monitoring compliant with ISO 19901-7:2013 | **MC 12.5**<br>Records confirm mooring system is tested to recommended tension as per API RP 2SK. |

## 6.8.8 Physical Presence (Unplanned): Accidental Introduction and Establishment of Invasive Marine Species

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| OPP Section 7.2.4 Physical Presence (Unplanned): IMS | | |
| **Context** | | |
| **Relevant Activities**<br>Installation of Subsea Infrastructure – **Section 3.8.10**<br>MODU Operations – **Section 3.9.1**<br>Vessel Operations – **Section 3.9.2** | **Existing Environment**<br>Marine Regional Characteristics – **Section 4.2** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Introduction and establishment of invasive marine species (IMS) within the PAA. | | | | | ✓ | ✓ | ✓ | A | E | 0 | L | LCS | Broadly Acceptable | EPO 13, 23 |

**Description of Source of Impact/Risk**

***Installation of Subsea Infrastructure, and MODU and Vessel Operations***

During the Petroleum Activities Program, vessels will be transiting to and from the PAA, potentially including traffic mobilising from beyond Australian waters. These project vessels may include the MODU, installation vessel or general support vessels (**Section 3.9.2**).

All vessels are subject to some level of marine fouling whereby organisms attach to the vessel hull. This could particularly occur in areas where organisms can find a good attachment surface (e.g. seams, strainers and unpainted surfaces) or where turbulence is lowest (e.g. niches, sea chests, etc.). Organisms can also be drawn into ballast tanks during onboarding of ballast water as cargo is loaded or to balance vessels under load.

During the Petroleum Activities Program, project vessels have the potential to introduce IMS to the PAA through marine fouling (containing IMS) on vessels as well as within high risk ballast water discharge. Cross contamination between vessels can also occur (e.g. IMS translocated between project vessels) during times when vessels need to be alongside each other.

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

IMS are a subset of Non-indigenous Marine Species (NIMS) that have been introduced into a region beyond their natural biogeographic range resulting in impacts to social/cultural, human health, economic and/or environmental values. NIMS are species that have the ability to survive, reproduce and establish founder populations. However, not all NIMS introduced into an area will thrive or cause demonstrable impacts; the majority of NIMS around the world are relatively benign and few have spread widely beyond sheltered ports and harbours. NIMS are only considered IMS when they result in impacts to environmental values and/or have social/cultural, economic and/or human health impacts.

Once introduced, IMS may prey on local species (which had previously not been subject to this kind of predation and therefore not have evolved protective measures against the attack), they may outcompete indigenous species for food, space or light and can also interbreed with local species, creating hybrids such that the endemic species is lost. These changes to the local marine environment result in changes to the natural ecosystem.

IMS have also proven economically damaging to areas where they have been introduced and established. Such impacts include direct damage to assets (fouling of vessel hulls and infrastructure) and depletion of commercially harvested marine life (e.g. shellfish stocks). IMS have proven particularly difficult to eradicate from areas once established. If the introduction is detected early, eradication may be effective but is likely to be expensive, disruptive and, depending on the method of eradication, harmful to other local marine life.

Potential IMS have historically been introduced and translocated around Australia by a variety of natural and human means, including marine fouling and ballast water. Potential IMS vary from one region to another depending on various environmental factors such as water temperature, salinity, nutrient levels and habitat type, which dictate their survival and invasive capabilities. IMS typically require hard substrate in the photic zone; therefore, requiring shallow waters to become established. Highly-disturbed, shallow-water environments such as shallow coastal waters, ports and marinas are more susceptible to IMS colonisation, whereas IMS are generally unable to successfully establish in deep-water ecosystems and open-water environments where the rate of dilution and the degree of dispersal are high.

***Epifauna and Infauna***

Epifauna and infauna are susceptible to impacts from IMS due to the risk of changes to the ecosystem dynamics such as competition for resources and predation.

Benthic productivity on the outer continental shelf and slope is low, and is a function of water depth, low nutrient availability, and the absence of hard substrates. Studies completed within the region indicate that benthic composition in deep-water habitats is generally lower in abundance than shallow water habitats of the region (DEWHA, 2008a; Brewer et al., 2007). The seafloor in the PAA is characterised by sparse marine life dominated by motile organisms (ERM, 2013). Such motile organisms included shrimp, sea cucumbers, demersal fish and small, burrowing worms and crustaceans. This soft bottom habitat is also supporting patchy distributions of mobile epibenthos, such as sea cucumbers, ophiuroids, echinoderms, polychaetes and sea-pens (DEWHA, 2008). The dominant types of epifauna were arthropods and echinoderms (especially shrimp and sea cucumbers, respectively), while the dominant infauna groups were crustaceans and polychaetes (ERM, 2013). Benthic communities in the PAA are representative of the Exmouth Plateau and of deep-water soft sediment habitats reported in the region.

While project vessels have the potential to introduce IMS into the PAA, the deep offshore open waters of the PAA (approximately 900–955 m) are not conducive to the settlement and establishment of IMS. Furthermore, the PAA are away from shorelines and/or critical habitat. The likelihood of IMS being introduced and establishing viable populations within the PAA or immediate surrounds is considered not credible.

Accordingly, impact to epifauna/infauna in the PAA is not considered credible. Receptor sensitivity for epifauna and infauna is low, leading to a Negligible (F) risk consequence.

***Industry, Shipping, Defence***

The establishment of IMS has the potential to cause changes to the functions, interests or activities of other users through indirect impact such as changes to fisheries target species resulting in economic and social implications, or due to compromised reputation to the oil and gas industry.

Given the low likelihood of IMS translocation to, and colonisation of environments within the PAA, project activities will not result in establishment of IMS, and as such not adversely affect other marine user activities in the region.

Based on the detailed impact evaluation, the magnitude of potential impacts of a change to the functions, interests or activities of other users is slight (see **Table 6-17**). Receptor sensitivity for industry, shipping and defence is medium, leading to a Slight (E) risk consequence. The likelihood of the risk event occurring is Remote, therefore the risk is assessed as Low.

***Summary***

In support of Woodside's assessment of the risks and consequences of IMS introduction associated with the Petroleum Activities Program, Woodside conducted a risk and impact evaluation of the different aspects of a marine pest translocation. The results of this assessment are presented in **Table** .

As a result of this assessment, Woodside has presented the highest potential consequence as a Slight (E) and likelihood as Remote (0), resulting in an overall Low risk following the implementation of identified controls.

**Table 6-17: Credibility, consequence and likelihood of introducing IMS**

| IMS Introduction Location | Credibility of Introduction | Consequence of Introduction | Likelihood |
|---|---|---|---|
| Introduced to Operational Area and establishment | **Not Credible** | | |

| | | | |
|---|---|---|---|
| on the seafloor or subsea structures | The deep offshore open waters of the Permit Area, away from shorelines and/or critical habitat, more than 50 km from a shoreline and in waters more than 100 m deep are not conducive to the settlement and establishment of IMS. | | |
| Introduced to Operational Area and establishment on a project vessel. | **Credible**<br>There is potential for the transfer of marine pests between project vessels within the Operational Area. | **Environment – Not Credible**<br>The translocation of IMS from a colonised MODU or project vessel to shallower environments via natural dispersion is not considered credible given the distances of the PAA from nearshore environments (i.e. greater than 12 nm/50 m water depth). There is therefore no credible environmental risk and the assessment is limited to Woodside's reputation.<br>**Reputation – E**<br>If IMS were to establish on a project vessel (i.e. MODU, installation vessel, activity project vessels) this could potentially impact the vessel operationally through the fouling of intakes, result in translocation of an IMS into the PAA and, depending on the species, potentially transfer of an IMS to other project vessels, which would likely result in the quarantine of the vessel until eradication could occur (through cleaning and treatment of infected areas), which would be costly to perform.<br>Such introduction would be expected to have slight impact to Woodside's reputation, particularly with Woodside's contractors, and would likely have a reputational impact on future proposals. | **Remote (0)**<br>Interactions between project vessel will be limited during the Petroleum Activities Program, with minimum 500 m safety exclusion zones being adhered to around the MODU and installation vessel, and interactions limited short periods of time alongside (i.e. during backloading, bunkering activities). There is also no direct contact (i.e. they are not tied up alongside) during these activities.<br>Spread of marine pests via ballast water or spawning in these open ocean environments is also considered remote. |
| Transfer between project vessels and from project vessels to other marine environments beyond the PAA. | **Not Credible**<br>This risk is considered so remote that it is not credible for the purposes of the activity.<br>The transfer of a marine pest between project vessels was already considered remote, given the offshore open ocean environment (i.e. transfer pathway discussed above).<br>For a marine pest to then establish into a mature spawning population on the new project vessel (which would have been through Woodside's IMS process) and then transfer to another environment is not considered credible (i.e. beyond the Woodside risk matrix). | | |

| | |
|---|---|
| | Project vessels will be located in an offshore, open ocean, deep environment, where IMS survival is implausible. Furthermore, this marine pest once transferred would need to survive on a new vessel with good vessel hygiene (i.e. has been through Woodside's risk assessment process) and survive the transport back from the PAA to shore. In the event it was to survive this trip, it would then need to establish a viable population in nearshore waters. |

| ***Summary of Assessment Outcomes*** | | | | | |
|---|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity** | **Risk Consequence** | **Likelihood** | **Risk Rating** |
| Epifauna and infauna | Change in ecosystem dynamics | Low value habitat (homogenous) | Negligible (F) | Remote | Low |
| Industry, Shipping, Defence | Changes to the functions, interests or activities of other users | Medium value | Slight (E) | Remote | Low |
| ***Overall Risk Consequence:*** The overall risk rating for the accidental introduction of IMS is Low given the remote offshore location of the PAA. The risk consequence/risk ratings for individual receptors are consistent with the levels rated in the OPP. | | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| Project vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements.<br>This applies to all project vessels that will enter the Operational Area, including those carrying out activities outside of Australian Territorial Seas (>12nm). | F: Yes.<br>CS: Minimal cost. Standard practice. | The use of an approved ballast water treatment system will reduce the likelihood of transfer of marine pests between project vessels within the PAA. No change in consequence would occur. | Controls based on legislative requirements under the *Biosecurity Act 2015* – must be adopted. | Yes<br>**C 13.1** |
| Internationally sourced Project vessels will manage their biosecurity risk associated with biofouling as specified in the Australian Biofouling Management Requirements. | F: Yes.<br>CS: Standard practice. | Reduces the likelihood of transfer of marine pests between vessels within the Operational Area. No change in consequence would occur. | Controls based on legislative requirements under the *Biosecurity Act 2015* – must be adopted. | Yes<br>**C 13.2** |
| ***Good Practice*** | | | | |
| Woodside's IMS risk assessment process will be applied to project vessels and immersible equipment that enter the Operational | F: Yes.<br>CS: Minimal cost. Good practice implemented across all Woodside Operations. | Identifies potential risks and additional controls implemented accordingly. In doing so, the likelihood of transferring marine | Benefits outweigh cost/sacrifice. | Yes<br>**13.3** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| Area, unless exempt (**Section 7.2.2**)<br>Based on the outcomes, management options commensurate with the risk will be implemented to minimise the likelihood of IMS being introduced. | | pests between project vessels within the Operational Area is reduced. No change in consequence would occur. | | |
| ***Professional Judgement - Eliminate*** | | | | |
| No discharge of ballast water during the Petroleum Activities Program. | F: No. Ballast water discharges are critical for maintaining vessel stability. Given the nature of the Petroleum Activities Program, the use of ballast (including the potential discharge of ballast water) is considered to be a safety critical requirement.<br>CS: Not assessed, control not feasible. | Not assessed, control not feasible. | Not assessed, control not feasible. | No |
| Eliminate use of MODU/vessels. | F: No. Given that vessels must be used to implement project, there is no feasible means to eliminate the source of risk.<br>CS: Loss of the project. | Not assessed, control not feasible. | Not assessed, control not feasible. | No |
| ***Professional Judgement - Substitute*** | | | | |
| Source project vessels based in Australia only. | F: Potentially.<br>Limiting activities to only use local project vessels could potentially pose a significant risk in terms of time and duration of sourcing a vessel, as well as the ability of the local vessels to perform the required tasks. For example, there are limited installation vessels based in Australian waters.<br>While the project will attempt to source project vessels locally it is not always possible. Availability cannot always be guaranteed | Sourcing vessels from within Australian will reduce the likelihood of IMS from outside Australian waters, however, it does not reduce the likelihood of introduction of species native to Australia but alien to the PAA and NWMR, or of IMS that have established elsewhere in Australia. The consequence is unchanged. | Disproportionate.<br>Sourcing vessels from Australian waters may result in a reduction in the likelihood of IMS introduction to the PAA; however, the potential cost of implementing this control is grossly disproportionate to the minor environmental gain (or reducing an already remote likelihood of IMS introduction) potentially achieved by using only Australian based | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | when considered competing Oil and Gas activities in the region. In addition, sourcing Australian based vessels only will cause increases in cost due to pressures of vessel availability.<br>CS: Significant cost and schedule impacts due to restrictions of vessel hire opportunities. | | vessels, consequently this risk is considered not reasonably practicable. | |
| IMS inspection of all vessels. | F: Yes. Approach to inspect vessels could be a feasible option.<br>CS: Significant cost and schedule impacts. In addition, Woodside's IMS risk assessment process (**C 13.3**) is seen to be more cost effective as this control allows Woodside to manage the introduction of marine pests through biofouling, while targeting its efforts to and resources to areas of greatest concern. | Inspection of all vessels for IMS would reduce the likelihood of IMS being introduced to the PAA. However, this reduction is unlikely to be significant given the other control measures implemented. No change in consequence would occur. | Disproportionate. The cost/sacrifice outweighs the benefit gained, as other controls to be implement achieve an ALARP position. | No |
| ***Professional Judgement – Engineered Solution*** | | | | |
| None identified. | | | | |
| **ALARP Statement:**<br>On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the risks and consequences of IMS introduction. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP. | | | | |

| Demonstration of Acceptability |
|---|
| ***Acceptability Criteria and Assessment*** |
| Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.2.4.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**):<br>• Overall risk consequence for individual receptors are less than the significant impact level defined in the OPP.<br>• EPOs and controls in the OPP that are relevant to an unplanned introduction of IMS have been adopted.<br>• There are no changes to internal/external context specific to this risk from the OPP, including issues raised during consultation. |
| ***Acceptability Statement:*** |

The impact assessment has determined that the accidental introduction and establishment of IMS represents a low current risk rating and is unlikely to result in a risk consequence greater than Slight. The adopted controls are considered consistent with industry legislation, codes and standards. Further opportunities to reduce the impacts have been investigated above.

The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of invasive marine species to an acceptable level.

| **Environmental Performance Outcomes, Standards and Measurement Criteria** | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 13**<br>Undertake the Petroleum Activities Program in a manner which does not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in an area defined as a Key Ecological Feature.<br><br>**EPO 23**<br>Undertake the Petroleum Activities Program in a manner which prevents a known or potential pest species (IMS) becoming established. | **C 13.1**<br>Project vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements.<br>This applies to all project vessels that will enter the Operational Area, including those carrying out activities outside of Australian Territorial Seas (>12nm). | **PS 13.1**<br>Prevent the translocation of IMS within the vessel's ballast water from high risk locations to the Operational Area. | **MC 13.1.1**<br>Ballast Water Records System maintained by vessels which verifies compliance against Australian Ballast Water Management Requirements. |
| | **C 13.2**<br>Internationally sourced Project vessels will manage their biosecurity risk associated with biofouling as specified in the Australian Biofouling Management Requirements. | **PS 13.2**<br>Compliance with Australian Biofouling Management Requirements. | **MC 13.2.1**<br>Records of implementation of biofouling management measures and pre-arrival reporting |
| | **C 13.3**<br>Woodside's IMS risk assessment process will be applied to project vessels and immersible equipment that enter the Operational Area, unless exempt (**Section 7.2.2**)<br>Based on the outcomes, management options commensurate with the risk will be implemented to minimise the likelihood of IMS being introduced. | **PS 13.3.1**<br>Before entering the Operational Area, project vessels, MODU and relevant immersible equipment are determined to be low risk of introducing IMS of concern. | **MC 13.3.1**<br>Records of IMS risk assessments maintained for all project vessels and relevant immersible equipment entering the operational area to undertake the Petroleum Activities Program. |
| | | **PS 13.3.3**<br>In accordance with Woodside's IMS risk assessment process, the IMS risk assessments will be undertaken by an authorised environment adviser who has completed relevant Woodside IMS training or by qualified and experienced IMS inspector. | **MC 13.3.2**<br>Records confirm that the IMS risk assessments undertaken by an Environment Adviser or IMS inspector (as relevant). |

## 6.8.9 Physical Presence (Unplanned): Collision with Marine Fauna

| Scarborough OPP – Relevant Impact Assessment Section | | |
|---|---|---|
| OPP Section 7.2.5 Physical Presence (Unplanned): Collision with Marine Fauna | | |
| **Context** | | |
| **Relevant Activities**<br>Vessel Operations – **Section 3.9.2** | **Existing Environment**<br>Marine Fauna of Conservation Significance – **Section 4.6** | **Consultation**<br>Consultation – **Section 5** |

**Impact/Risk Evaluation Summary**

| ***Source of Impact/Risk*** | ***Environmental Value Potentially Impacted*** | | | | | | | ***Evaluation*** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Soil and Groundwater** | **Marine Sediment** | **Water Quality** | **Air Quality (inc. odour)** | **Ecosystems / Habitat** | **Species** | **Socio-economic** | **Decision Type** | **Impact/Consequence** | **Likelihood** | **Current Risk Rating** | **ALARP Tools** | **Acceptability** | **Outcome** |
| Accidental collision between MODU/project vessels and protected marine fauna | | | | | | ✓ | | A | E | 1 | L | LCS<br>GP<br>PJ | Broadly Acceptable | EPO 26 |

**Description of Source of Impact/Risk**

***Vessel Operations***

Activities associated with the Petroleum Activities Program will require vessels for subsea installation, support operations and supply/transport. The type and number of vessels in the PAA at any one time, and the duration of presence, will differ depending on the activities being undertaken. Physical presence of vessels may result in unplanned collision with marine fauna including marine mammals, marine reptiles and fish.

**Detailed Impact Assessment**

***Assessment of Potential Impacts***

Project vessels operating in and around the PAA may present a potential hazard to marine mammals and other protected marine fauna, such as marine turtles. Vessel movements can result in collisions between the vessel (hull and propellers) and marine fauna, potentially resulting in superficial injury, serious injury that may affect life functions (e.g. movement and reproduction), or mortality. Marine fauna are also at risk of mortality through being caught in thrusters during station keeping operations (dynamic positioning).

The likelihood of vessel/fauna collision being lethal is influenced by vessel speed—the greater the speed at impact, the greater the risk of mortality (Jensen and Silber, 2004; Laist et al., 2001). Vanderlaan and Taggart (2007) found that the chance of lethal injury to a large whale as a result of a vessel strike increases from about 20% at 8.6 knots to 80% at 15 knots. Project vessels within the PAA are likely to be travelling <8 knots (and will often be stationary) within the 500 m zone for the MODU. At times, vessels will be transiting between wells where speed could be up to a maximum of about 15 knots, however these would only be transitory through the area. Therefore, the chance of a vessel collision with protected species resulting in a lethal outcome is considered unlikely.

The risk of marine life getting caught in operating thrusters is unlikely, given the low presence of individuals, combined with the avoidance behaviour commonly displayed during dynamic positioning operations.

***Marine Mammals***

As described above, vessel speed influences the probability of a vessel collision with a cetacean and also whether a collision may result in lethal injury (Vanderlaan and Taggart, 2007). Additionally, behaviour of individuals may also influence the likelihood of a collision occurring. Although large cetaceans are expected to show localised avoidance in response to vessel noise, studies have reported limited behavioural response to approaching ships (McKenna et al.,

2015) and individuals engaging in behaviours such as feeding, mating or nursing may be less aware of their surroundings and more susceptible to collision (Laist et al., 2001).

No known key aggregation areas for marine mammals (resting, breeding or feeding) are located within or immediately adjacent to the PAA. However, individuals may occasionally be present in the PAA, including pygmy blue whales during seasonal migrations (**Section 4.6.5**). Eleven species of dolphin were identified that may occur in the PAA. However, most dolphins show preference for coastal habitats over deep offshore waters. This reduces the likelihood of dolphin species being encountered in the PAA and interacting with project vessels.

According to the data of Vanderlaan and Taggart (2007), it is estimated that the risk of lethal injury to a large whale as a result of a vessel strike is less than 10% at a speed of 4 knots. Vessel-whale collisions at this speed are uncommon and, based on reported data contained in the NOAA database (Jensen and Silber, 2004) there are only two known instances of collisions when the vessel was travelling at less than 6 knots; both of these were from whale-watching vessels that were deliberately positioned amongst whales

Smaller cetaceans, such as dolphins, comprise a lower proportion of vessel collision records (DoEE, 2016), though it is difficult to determine if this is due to a lower collision rate or lower detection rate of incidents. Dolphins often engage in bow riding which may make them more vulnerable to entanglement with propellers or thrusters compared to larger cetaceans.

***Marine Reptiles***

The Recovery Plan for Marine Turtles in Australia recognises turtles are at risk from vessel strikes, particularly in shallow coastal foraging habitats and internesting areas where there are high numbers of recreational and commercial vessels (Commonwealth of Australia, 2017). Considering the offshore location, it is expected that the presence of marine turtles would be very unlikely and only comprise individuals transiting the open, offshore waters for short periods of time. It is expected that individuals will respond to vessel presence by avoiding the immediate vicinity of the vessels and, combined with low vessel speed, will reduce the likelihood of a vessel-turtle collision.

It is unlikely that vessel movement associated with the Petroleum Activities Program will have a significant impact on marine fauna populations, given the low presence of transiting individuals and the low operating speed of the support vessels (generally <8 knots or stationary, unless operating in an emergency).

***Marine Fauna Summary***

Potential impacts from collision with marine fauna will not result in a substantial adverse effect on a population or the spatial distribution of the population. Additionally, no adverse impact on marine ecosystem functioning or integrity or impacts to lifecycles of the population of migratory whales will occur.

| ***Summary of Assessment Outcomes*** | | | | | |
|---|---|---|---|---|---|
| **Receptor** | **Impact** | **Receptor Sensitivity** | **Risk Consequence** | **Likelihood** | **Risk Rating** |
| Marine Mammals | Injury to/ mortality of fauna | High value species | Slight (E) | Highly Unlikely | Low |
| Marine Reptiles | Injury to/ mortality of fauna | High value species | Slight (E) | Highly Unlikely | Low |
| ***Overall Risk Consequence:*** The overall risk rating is Low based on slight consequence, to the high value receptors (marine mammals and reptiles) and a highly unlikely likelihood. The risk rating/risk consequence for individual receptors are consistent with the levels rated in the OPP. | | | | | |

| **Demonstration of ALARP** | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| ***Legislation, Codes and Standards*** | | | | |
| EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, | F: Yes.<br>CS: Minimal cost. Standard practice. | Implementation of these controls will reduce the likelihood of a collision between a cetacean and vessel from occurring. The consequence of | Controls based on legislative requirements – must be adopted. | Yes<br>**C 3.1** |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| including the following measures[40]:<br>• Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution zone) and not approach closer than 100 m from a whale.<br>• Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding).<br>• If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. | | a collision is unchanged. | | |
| Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to pproach closer than 30 m of a whale shark[40] | F: Yes.<br>CS: Minimal cost. Standard practice | Implementation of these controls will reduce the likelihood of a collision between a whale shark and vessel occurring. The consequence of a collision is unchanged. | F: Yes. | F: Yes.<br>**C 3.5** |
| ***Good Practice*** | | | | |
| Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone).<br>If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots[40]. | F: Yes.<br>CS: Minimal cost. Standard practice | Implementation of these controls will reduce the likelihood of a collision between a turtle and vessel occurring. The consequence of a collision is unchanged. | F: Yes. | F: Yes.<br>**C 3.6** |
| Variation of the timing of the Petroleum Activities Program to avoid whale migration periods. | F: No. Timing of activities is linked to MODU schedule. Timing of all activities is currently not determined, and due to MODU availability and operational requirements, | Not considered – control not feasible. | Not considered – control not feasible. | No |

[40] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |
| | undertaking activities during migration seasons may not be able to be avoided.<br>CS: Not considered – control not feasible. | | | |
| ***Professional Judgement – Eliminate*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Substitute*** | | | | |
| No additional controls identified. | | | | |
| ***Professional Judgement – Engineered Solution*** | | | | |
| The use of dedicated MFOs on project vessels for the duration of each activity to watch for whales and provide direction on and monitor compliance with Part 8 of the EPBC Regulations. | F: Yes. However, vessel bridge crews already maintain a constant watch during operations in compliance with the Woodside Marine – Charterers Instructions on the requirements of vessel and whale interactions, and crew undertake specific cetacean observation training.<br>CS: Additional cost of MFOs | Given that project vessel bridge crews already maintain a constant watch during operations in compliance with the Woodside Marine – Charterers Instructions, additional MFOs would not significantly further reduce the risk. | Disproportionate. The cost/sacrifice outweighs the benefit gained. | No |
| Manage Vessel speed to reduce likelihood of interaction with marine fauna | F: Yes.<br>CS: Good practice | There is an established relationship between the likelihood of vessel strikes to whales and the speed of the vessel. However, the PAA does not overlap with any cetacean BIAs or critical habitat and the presence of marine fauna is likely to be limited to infrequent occurrences of individuals or small groups. Therefore, there is no further risk reduction from the application of this control. | Given the slow speeds at which vessels operate, the likely presence of marine fauna in the PAA and the controls currently in place (C3.1) the adoption of this control offers no further reduction in risk. | No |

| Demonstration of ALARP | | | | |
|---|---|---|---|---|
| ***Control Considered*** | ***Control Feasibility (F) and Cost/Sacrifice (CS)*** | ***Benefit in Impact/Risk Reduction*** | ***Proportionality*** | ***Control Adopted*** |

**ALARP Statement:**

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the risks and consequences of potential vessel collision with protected marine fauna. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.

Woodside acknowledges that uncertainty on cultural values may remain; however, the Ongoing Program on Traditional Custodian Feedback (EPO 27 and C4.9) has been developed to enable Woodside to manage potential uncertainty on the impacts and risks to cultural values which may be identified at any time during Woodside's activities via ongoing dialogue with Traditional Custodians.

## Demonstration of Acceptability

### *Acceptability Criteria and Assessment*

Demonstration of acceptability for the sources of aspect and associated impacts assessed in this section are provided in Section 7.2.5.3 of the Scarborough OPP (SA0006AF0000002, rev 5). The Petroleum Activities Program meets the acceptability criteria (**Section 2.3.5**):

- Overall risk consequence/risk ratings for individual receptors are less than the significant impact level defined in the OPP.
- EPOs and controls in the OPP that are relevant to an unplanned seabed disturbance have been adopted.
- There are no changes to internal/external context specific to this risk from the OPP.
- Potential impacts to marine fauna from a vessel strike was raised during consultation (**Appendix F, Table 1**) and this feedback was considered in the finalisation of the EP.

***Acceptability Statement:***

The impact assessment has determined that, given the adopted controls, a vessel collision with marine fauna represents a low current risk rating that is unlikely to result in a risk consequence to marine fauna greater than Slight. There are no BIAs for any EPBC Act listed Threatened or Migratory species overlapping or adjacent to the PAA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice (**Section 6.9**). The adopted controls are considered consistent with industry good practice and professional judgement and meet the requirements of Part 8 (Division 8.1) of the EPBC Regulations 2000. The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of vessel collision with marine fauna to a level that is broadly acceptable.

| Environmental Performance Outcomes, Standards and Measurement Criteria | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| **EPO 26**<br>Undertake the Petroleum Activities Program in a manner which prevents a vessel strike with protected marine fauna during project activities. | **C 3.1**<br>See **Section 6.7.3** | **PS 3.1**<br>See **Section 6.7.3** | **MC 3.1.1**<br>See **Section 6.7.3** |
| | **C 3.5**<br>See **Section 6.7.3** | **PS 3.5**<br>See **Section 6.7.3** | **MC 3.5.1**<br>See **Section 6.7.3** |
| | **C 3.6**<br>See **Section 6.7.3** | **PS 3.6**<br>See **Section 6.7.3** | **MC 3.6.1**<br>See **Section 6.7.3** |

## 6.9 Recovery Plan and Threat Abatement Plan Assessment

As described in **Section 1.10.2.2**, an EP must not be inconsistent with a recovery plan or threat abatement plan for a listed threatened species or ecological community. This section describes the assessment that Woodside has undertaken to demonstrate that the Petroleum Activities Program is not inconsistent with any relevant recovery plans or threat abatement plans. For the purposes of this assessment, the relevant Part 13 statutory instruments (recovery plans and threat abatement plans) are:

- Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017).
- Conservation Management Plan for the Blue Whale - A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 2015-2025 (Commonwealth of Australia, 2015a).
- Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (DoEE, 2018).

**Table 6-18** lists the objectives and (where relevant) the action areas of these plans, and also describes whether these objectives/action areas are applicable to government, the Titleholder and/or the Petroleum Activities Program. For those objectives/action areas applicable to the Petroleum Activities Program, the relevant actions of each plan have been identified, and an evaluation has been conducted as to whether impacts and risks resulting from the activity are clearly inconsistent with that action or not. The results of this assessment against relevant actions are presented in **Table 6-19** to **Table 6-21**.

The assessment of potential impacts and risks to pygmy blue whales from underwater noise emissions in **Section 6.7.3** has taken into account the definitions of terminology in the CMP, as described in the DAWE and NOPSEMA guidance released in September 2021. Similarly, the assessment against relevant actions in the CMP in **Table 6-20** has been undertaken in the context of the definitions included in the guidance note.

**Table 6-18: Identification of applicability of recovery plan and threat abatement plan objectives and action areas**

| EPBC Act Part 13 Statutory Instrument | Applicable to: | | |
|---|---|---|---|
| | ***Government*** | ***Titleholder*** | ***Petroleum Activities Program*** |
| ***Marine Turtle Recovery Plan*** | | | |
| **Long-term Recovery Objective:** Minimise anthropogenic threats to allow for the conservation status of marine turtles to improve so they can be removed from the EPBC Act threatened species list | Y | Y | Y |
| ***Interim Recovery Objectives*** | | | |
| Current levels of legal and management protection for marine turtle species are maintained or improved, both domestically and throughout the migratory range of Australia's marine turtles | Y | | |
| The management of marine turtles is supported | Y | | |
| Anthropogenic threats are demonstrably minimised | Y | Y | Y |
| Trends in nesting numbers at index beaches and population demographics at important foraging grounds are described | Y | Y | |
| ***Action Areas*** | | | |
| **A. Assessing and addressing threats** | | | |

| EPBC Act Part 13 Statutory Instrument | Applicable to: | | |
|---|---|---|---|
| | ***Government*** | ***Titleholder*** | ***Petroleum Activities Program*** |
| A1. Maintain and improve efficacy of legal and management protection | Y | | |
| A2. Adaptively manage turtle stocks to reduce risk and build resilience to climate change and variability | Y | | |
| A3. Reduce the impacts of marine debris | Y | Y | Y |
| A4. Minimise chemical and terrestrial discharge | Y | Y | Y |
| A5. Address international take within and outside Australia's jurisdiction | Y | | |
| A6. Reduce impacts from terrestrial predation | Y | | |
| A7. Reduce international and domestic fisheries bycatch | Y | | |
| A8. Minimise light pollution | Y | Y | Y |
| A9. Address the impacts of coastal development/infrastructure and dredging and trawling | Y | Y | |
| A10. Maintain and improve sustainable Indigenous management of marine turtles | Y | | |
| **B. Enabling and measuring recovery** | | | |
| B1. Determine trends in index beaches | Y | Y | Y |
| B2. Understand population demographics at key foraging grounds | Y | | |
| B3. Address information gaps to better facilitate the recovery of marine turtle stocks | Y | Y | Y |
| ***Blue Whale Conservation Management Plan*** | | | |
| Long-term recovery objective: Minimise anthropogenic threats to allow for their conservation status to improve so that they can be removed from the EPBC Act threatened species list | Y | Y | Y |
| ***Interim Recovery Objectives*** | | | |
| The conservation status of blue whale populations is assessed using efficient and robust methodology | Y | | |
| The spatial and temporal distribution, identification of biologically important areas, and population structure of blue whales in Australian waters is described | Y | Y | Y |
| Current levels of legal and management protection for blue whales are maintained or improved and an appropriate adaptive management regime is in place | Y | | |
| Anthropogenic threats are demonstrably minimised | Y | Y | Y |
| ***Action Areas*** | | | |
| **A. Assessing and addressing threats** | | | |
| A.1: Maintain and improve existing legal and management protection | Y | | |
| A.2: Assessing and addressing anthropogenic noise | Y | Y | Y |
| A.3: Understanding impacts of climate variability and change | Y | | |
| A.4: Minimising vessel collisions | Y | Y | Y |
| **B. Enabling and Measuring Recovery** | | | |
| B.1: Measuring and monitoring population recovery | Y | | |

| EPBC Act Part 13 Statutory Instrument | Applicable to: | | |
|---|---|---|---|
| | ***Government*** | ***Titleholder*** | ***Petroleum Activities Program*** |
| B.2: Investigating population structure | Y | | |
| B.3: Describing spatial and temporal distribution and defining biologically important habitat | Y | Y | Y |
| ***Marine Debris Threat Abatement Plan*** | | | |
| ***Objectives*** | | | |
| Contribute to long-term prevention of the incidence of marine debris | Y | Y | |
| Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations | Y | Y | Y |
| Remove existing marine debris | Y | | |
| Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris | Y | | |
| Increase public understanding of the causes and impacts of harmful marine debris, including microplastic and hazardous chemical contaminants, to bring about behaviour change | Y | | |

**Table 6-19: Assessment against relevant actions of the Marine Turtle Recovery Plan**

| Part 13 Statutory Instrument | Relevant Action Areas/Objectives | Relevant Actions | Evaluation | EPO, Controls and PS |
|---|---|---|---|---|
| ***Marine Turtle Recovery Plan*** | **Action Area A3**: Reduce the impacts from marine debris | **Action**: Support the implementation of the Marine Debris Threat Abatement Plan (TAP)<br>Priority actions at stock level:<br>• G-NWS – understand the threat posed to this stock by marine debris<br>• LH-WA – determine the extent to which marine debris is impacting loggerhead turtles<br>• F-Pil and H-WA – no relevant actions | Refer **Section 6.8.6**<br>**Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to marine turtles. | **EPO 4, 19**<br>**C 11.1, 11.4**<br>**EPS 11.1, 11.4** |
| | **Action Area A4**: Minimise chemical and terrestrial discharge | **Action**: Ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g. nesting habitat, seagrass meadows or coral reefs<br>Priority actions at stock level:<br>• G-NWS – ensure that spill risk strategies and response programs include management for turtles and their habitats<br>• LH-WA, F-Pil – ensure that spill risk strategies and response programs include management for turtles and their habitats, particularly in reference to slow to recover habitats, e.g. seagrass meadows or corals<br>• H-WA – no relevant actions | Refer **Sections 6.8.2, 6.8.4, 6.8.5** and **Appendix D**<br>**Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to marine turtles. Spill risk strategies and response program include management measures for turtles and their nesting habitats. | Refer **Section 7.10**.<br>Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D** |
| | | **Action**: Routine discharges from MODU and project vessels are managed such that marine turtles are not adversely affected by changes in water quality.<br>Priority actions at stock level:<br>• G-NWS – as above<br>• LH-WA, F-Pil – as above<br>• H-WA – no relevant actions | Refer **Section 6.7.6**<br>**Not inconsistent assessment:** The assessment of routine discharges of chemicals, deck drainage, treated sewerage, putrescible wastes and grey water has considered the potential risks to marine turtles. Individuals transiting the localised area may come into contact with routine discharges, however these are sporadic and | **EPO 11**<br>**C 6.1, 6.3, 6.4. 6.5**<br>**EPS 6.3, 6.4. 6.5** |

| Part 13 Statutory Instrument | Relevant Action Areas/Objectives | Relevant Actions | Evaluation | EPO, Controls and PS |
|---|---|---|---|---|
| | | | in small quantities, and are unlikely to pose a significant risk. | |
| | **Action Area A8**: Minimise light pollution | **Action**: Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats<br>Priority actions at stock level:<br>• G-NWS – as above<br>• LH-WA – no relevant actions<br>• F-Pil and H-WA – manage artificial light from onshore and offshore sources to ensure biologically important behaviours of nesting adults and emerging/dispersing hatchlings can continue | Refer **Section 6.7.1.**<br>**Not inconsistent assessment**: The assessment of light emissions has considered the potential impacts to marine turtles. Internesting, mating, foraging or migrating turtles are not impacted by light from offshore vessels. Vessel light emissions could cause localised and temporary behavioural disturbance to isolated transient individuals, which is unlikely to result in displacement of adult turtles from internesting or nesting habitat critical to the survival of marine turtles. | **EPO 3, 4**<br>**C 1.1**<br>**EPS 1.1** |
| | **Action Area B1**: Determine trends at index beaches | **Action**: Maintain or establish long-term monitoring programs at index beaches to collect standardised data critical for determining stock trends, including data on hatchling production<br>Priority actions at stock level:<br>• G-NWS – continue long-term monitoring of index beaches<br>• LH-WA – continue long-term monitoring of nesting and foraging populations<br>• F-Pil and H-WA – no relevant actions | **Not inconsistent assessment**: Woodside contributes to Action Area B1 via its support of the Ningaloo Turtle Program[41]. Given the offshore location of the PAA, impacts to turtle nesting beaches will not occur. | N/A |
| | **Action Area B3**: Address information gaps to better facilitate the recovery of marine turtle stocks | **Action**: Understand the impacts of anthropogenic noise on marine turtle behaviour and biology<br>Priority actions at stock level:<br>• G-NWS – given this is a relatively accessible stock that is likely to be exposed to anthropogenic noise – Investigate the impacts of anthropogenic noise on turtle behaviour and | Refer **Section 6.7.3.**<br>**Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to flatback and olive ridley turtles. Vessel acoustic emissions could cause localised and short-term behavioural disturbance to isolated transient individuals, which is unlikely to | **EPO 3, 7, 8**<br>**C 3.1**<br>**PS 3.1** |

[41] http://www.ningalooturtles.org.au/media_reports.html

| Part 13 Statutory Instrument | Relevant Action Areas/Objectives | Relevant Actions | Evaluation | EPO, Controls and PS |
|---|---|---|---|---|
| | | biology and extrapolate findings from the North West Shelf stock to other stocks<br>• LH-WA, F-Pil – no relevant actions<br>• H-WA – investigate mixed stock genetics at foraging grounds | result in displacement of adult turtles from internesting or nesting habitat critical to the survival of marine turtles. | |
| **Assessment Summary**<br>The Marine Turtle Recovery Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan. | | | | |

**Table 6-20: Blue Whale Conservation Management Plan**

| Part 13 Statutory Instrument | Relevant Action Areas/Objectives | Relevant Actions | Evaluation | EPO, Controls and PS |
|---|---|---|---|---|
| ***Blue Whale Conservation Management Plan*** | **Action Area A.2**: Assessing and addressing anthropogenic noise | **Action 2**: Assessing the effect of anthropogenic noise on blue whale behaviour<br>**Action 3**: Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to use the area without injury, and is not displaced from a foraging area | Refer **Section 6.7.3.**<br>**Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to pygmy blue whales. | **EPO 3, 7, 8**<br>**C 3.1**<br>**PS 3.1** |
| | **Action Area A.4**: Minimising vessel collisions | **Action 3**: Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented | Refer **Section 6.8.9**<br>**Not inconsistent assessment**: The assessment of vessel collision with marine fauna has considered the potential risks to pygmy blue whales. If the Petroleum Activities Program overlaps with the northern migration, individuals may deviate slightly from migratory route, but will continue on their migration to possible breeding grounds in Indonesian waters. Vessel collisions with pygmy blue whales are highly unlikely to occur, given the very slow vessel speeds and presence of MFOs. | **EPO 26**<br>**C 3.1**<br>**PS 3.1** |

| Part 13 Statutory Instrument | Relevant Action Areas/Objectives | Relevant Actions | Evaluation | EPO, Controls and PS |
|---|---|---|---|---|
| | **Action Area B.3**: Describing spatial and temporal distribution and defining biologically important habitat | **Action 2**: Identify migratory pathways between breeding and feeding grounds<br>**Action 3**: Assess timing and residency within Biologically Important Areas | **Not inconsistent assessment**: Woodside contributes to Action Area B3 via its support of targeted research initiatives (e.g. satellite tracking of pygmy blue whale migratory movements[42]). | N/A |
| **Assessment Summary**<br>The Blue Whale Conservation Management Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan. | | | | |

**Table 6-21: Assessment against relevant Marine Debris Threat Abatement Plan**

| Part 13 Statutory Instrument | Relevant Action Areas/Objectives | Relevant Actions | Evaluation | EPO, Controls and PS |
|---|---|---|---|---|
| ***Marine Debris TAP*** | **Objective 1:** Contribute to long-term prevention of marine debris. | **Action 1.02**: Limit the amount of single use plastic material lost to the environment in Australia. | Refer **Section 6.8.6.**<br>**Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to vertebrate wildlife. | **EPO 2, 3, 4, 8, 19, 20, 21**<br>**C 11.1, 11.2, 11.3 11.4**<br>**EPS 11.1, 11.2, 11.3 11.4** |
| **Assessment Summary**<br>The Marine Debris TAP has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan. | | | | |

[42] Double, M.C., Andrews-Goff, V., Jenner, K.C.S., Jenner, M.-N., Laverick, S.M., Branch, T.A., Gales, N.J., 2014. Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. PloS One 9, e93578

## 6.10 Cultural Features and Heritage Values Assessment

As described in **Section 4**, the identification of cultural values associated with cultural heritage as well as the social, economic and cultural features important to First Nation's people is integral to understanding the environment and any potential impacts and risks to the environment.

In line with Woodside's First Nations Communities Policy (Woodside 2022), Woodside seeks to avoid damage or disturbance to cultural heritage (including intangible heritage) and, if avoidance is not possible, minimise and mitigate the impacts, in consultation with First Nation communities and Traditional Custodians. Mitigation can include any measure or control aimed at ensuring the viability of the intangible cultural heritage and its intergenerational transmission. This can include reducing impacts and risks to environmental features that are associated with intangible cultural heritage (UNESCO 2003; ICOMOS 2013).

It is important to note that not all topics raised by First Nations groups / individuals through consultation are considered values for the purpose of the cultural features and heritage values impact assessment below. A number of topics were raised as a general interest in environmental management and ecosystem health, where the group/individual was seeking further information about potential impacts and risks from the Petroleum Activities Program on the receptor. As these interests relate to the maintenance of the natural environment, these are adequately addressed through impact and risk assessments described in **Sections 6.7** and **6.8** respectively and not further assessed below.

| Aspect | Cultural Features and Heritage Values |
|---|---|
| **Description of source impact/ risk** | The physical presence of the MODU and vessels and associated movements in the PAA, as well as physical presence of subsea infrastructure, have the potential to impact or be a risk to cultural features and heritage values.<br><br>**MODU and Vessel Operations**<br><br>The Petroleum Activities Program includes drilling up to ten new development wells (two of which are contingency). Inspection, monitoring, maintenance and repair activities may also be conducted on any of the proposed new development wells within Permit Area WA-61-L. While wells may be batch drilled, only one well will be drilled at any given time. Drilling operations for the development wells is expected to take approximately 60 days per well to complete, including mobilisation, demobilisation and contingency. This is equivalent to 480 days for the eight planned wells (with an additional 120 days as required for the two contingent wells).<br><br>Other vessels may also be required during the activities, including subsea support vessel for light well intervention and other support vessels. Some vessels will need to transit in and out of the PAA to port for routine and emergency operations.<br><br>The temporary presence of the MODU and project vessels in the PAA will result in a navigational hazard for commercial shipping within the immediate area. This navigational hazard could result in a third party vessel colliding with the MODU or a project vessel which could release hydrocarbons. A volume of 250 $m^3$ of marine diesel is considered an appropriate worst-case for a single fuel tank, based on existing facilities. and forms the basis of the EMBA (refer to **Section 6.8.2**).<br><br>**Physical presence of subsea infrastructure**<br><br>The subsea xmas trees and wellheads will be located within the PAA. The physical presence of this infrastructure will remain for the duration of field life. Wellheads and xmas trees take up a small area on the seabed and will rise several metres above the seabed.<br><br>These construction activities have the potential to cause various emissions and discharges (as described and impact assessed in **Section 6.7**) and the potential for unplanned risks (as described and risk assessed in **Section 6.8**). The Impact Significance Level and Risk Rating respectively for each of the marine fauna receptor identified as cultural value are provided in the subsequent section for context. |

**Receptor sensitivity**

Cultural features and heritage values: High value

Marine mammals: High value species

Marine reptiles: High value species

Fish: High value species

**Planned Activities**

*The potential environmental impact to species that have a cultural feature or heritage value have been summarised below to provide the context of a potential impact significance level to those species to understand any cumulative impact on the cultural feature or heritage value.*

| Aspect | Impact Significance Level | | |
|---|---|---|---|
| Environmental impact assessment to marine species | Marine mammals | Marine reptiles | Fish |
| 6.7.1 Routine Light Emissions: External Lighting on MODU and Project Vessels | N/A | Slight (E) | N/A |
| 6.7.3 Routine Acoustic Emissions – Generation of Noise from MODU, Project Vessels and Positioning Equipment | Slight (E) | Slight (E) | Slight (E) |
| 6.7.6 Routine and Non-Routine Discharges: MODU and Project Vessels | Slight (E) | Slight (E) | Slight (E) |

**Unplanned Activities**

*The potential environmental risk to species that have a cultural feature or heritage value have been summarised below to provide the context of a potential impact significance level to those species to understand any cumulative impact on the cultural feature or heritage value*

| Aspect | Risk Rating | | |
|---|---|---|---|
| Environmental risk assessment to marine species | Marine mammals | Marine reptiles | Fish |
| 6.8.2 Unplanned Hydrocarbon Release: Vessel Collision | Moderate | Moderate | Moderate |
| 6.8.4 Unplanned Discharge: Chemicals and Hydrocarbons | Low | Low | Low |
| 6.8.5 Unplanned Discharge: Bunkering | Moderate | Moderate | Moderate |
| 6.8.6 Unplanned Discharge: Hazardous and Non – Hazardous Solid Waste/Equipment | Low | Low | Low |
| 6.8.9 Physical Presence (Unplanned): Collision with Marine Fauna | Low | Low | N/A |

**Impact and Risk Assessment**

The Petroleum Activities Program has the potential to impact cultural features and heritage values through the following ways:

Intangible cultural heritage:

- Songlines: Songlines can become lost, fragmented, or broken when there is a loss of Country or forced removal from Country (Neale and Kelly 2020:30). Physical sites that have been identified as comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. It is noted that oil and gas infrastructure exists in many areas of the North West Shelf, and that songlines are still acknowledged and recognised. It is inferred that if there were to be any impacts to surviving songlines these would be significantly more likely to be described as qualitative (i.e. "weaken" a songline) rather than binary or absolute (i.e. destroy a songline).
- Creation/dreaming sites; sacred sites; ancestral beings: Activities that physically alter landscape features may be assumed to potentially impact values of creation/dreaming sites, sacred sites or ancestral beings.
- Cultural obligations to care for Country: Environmental impacts may be assumed to impact rights and obligations to care for Sea Country. Exclusion of Traditional Custodians from Sea Country (e.g., by restricting access) or decision-making processes (e.g. by not conducting ongoing consultation) are other potential sources of impact.
- Knowledge of Country/customary law and transfer of knowledge: Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population. Therefore, the transmission of these skills is expected to be impacted where there are impacts at the species/population level. Limitations on access to sites or disruption/relocation of First Nations communities may have implications for the preservation of First Nations knowledge.
- Connection to Country: Where people are displaced or disrupted (e.g., during colonisation) or where there is a loss of technical skills or environmental knowledge this may damage connection to Country (McDonald and Phillips, 2021).
- Access to Country: Impacts to access to Country may be classified as temporary (e.g. where exclusion zones exist around activities for safety reasons) or permanent (e.g. where infrastructure obstructs access or navigation). Impacts to access to Country can only occur in areas that were traditionally accessed by Traditional Custodians. As described in **Section 4.9.1.5** this is anticipated to be focussed on areas adjacent to the coast.
- Kinship systems and totemic species: It is assumed that marine species may have kinship/totemic relationships to Traditional Custodians, but it is understood that these relationships do not prohibit people outside of that "skin group" from hunting or eating that same species (Juluwarlu 2004). It is therefore inferred that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals.
- Resource collection: Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, marine species (as resources) will be impacted where there is an impact at the species/population level.

Marine ecosystems and species:

- Marine ecosystems may hold both cultural and environmental value (see **Section 4.9.1**), with cultural and environmental values intrinsically linked (DCCEEW 2023, MAC 2021 as cited in Woodside 2023a). It necessarily follows that an impact to marine ecosystems has the potential to impact cultural features where the impact is detectable within Sea Country—the seascape which Traditional Custodians view, interact with or hold knowledge of.

***Intangible values***

*Songlines*

Management of intangible cultural heritage can include reducing impacts and risks to tangible features that are associated with intangible cultural heritage (UNESCO 2003; ICOMOS 2013). Impacts to marine plants, animals and other cultural features associated with songlines might impact the intergenerational transmission of knowledge of songlines when individuals can no

longer witness or interact with the cultural features tied to songlines on Country. Therefore, managing songlines may require environmental controls to minimise potential impact to marine fauna at a population level, including migratory routes. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section 6.7 and 6.8 respectively.

Physical features comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. Songlines can become lost, fragmented, or broken when there is a loss of Country or impact to culturally important physical features (Neale and Kelly 2020:30). No specific details of songlines within the EMBA have been provided by relevant persons during consultation for this Activity, and no landforms typical of songlines (e.g. rocks, mountains, rivers, caves and hills (Higgins 2021:724)) are anticipated to be impacted by the Activity.

In publicly available literature, Murujuga is acknowledged a starting point for songlines, including the flying fox songline (MAC 2023a). Precise location of this songline, and features of this songline that might be impacted, are not clearly articulated in the reviewed sources, but it is stated that “the sea is a source of creation for flying foxes” (DEC 2013). Although this does not provide the specificity required to determine the location of the flying fox songline or associated sites, however Murujuga is located outside of the EMBA. Ethnographic survey (**Section 4.9.1.5.2**) also noted that “Dreamtime narratives… that commence at Murujuga and may also arrive from the sea including the… Bat (Flying Fox)” (McDonald and Phillips 2021). Although this does not provide the specificity required to determine the location of the flying fox songline or associated sites, Murujuga is located outside of the EMBA. The ethnographic survey did not identify any sites within the EMBA related to songlines, or make recommendations that any mitigations were required to manage songlines. Consultation with MAC and other Traditional custodians has not identified the flying fox songline as overlapping the EMBA, and flying foxes do not occur within the EMBA.

In publicly available literature, Murujuga is acknowledged a starting point for songlines, including the seven sisters songline (Bainger 2021). Precise location of this songline, and features of this songline that might be impacted, are not clearly articulated in the reviewed sources, however Murujuga is located outside of the EMBA. Ethnographic survey (**Section 4.9.1.5.2**) also noted that “a number of Dreamtime narratives… extend from the waters around Murujuga on to country, including the *KurriKurri* (Seven Sisters)” (McDonald and Phillips 2021). The seven sisters story is associated with Whitnell [sic] Bay, Murujuga, Depuch Island and Port Hedland, all being outside of the EMBA (McDonald and Phillips 2021). The ethnographic survey did not identify any sites within the EMBA related to songlines, or make recommendations that any mitigations were required to manage songlines. Consultation with MAC and other Traditional custodians has not identified the seven sisters songline as overlapping the EMBA.

The existence of a whale songline potentially intersecting the EMBA has also been asserted by members of Save Our Songlines (**Table 4-17**). Consultation with this group and associated individuals has not provided detail on the presence, features or route of this songline. The most detailed description available to Woodside is asserted in the Concise Statement and Affidavit filed by [redacted] in the context of Scarborough seismic activities. Specifically, “whales carry important songlines, the whale dreaming, and connection between land and sea.” Specific details regarding the whale dreaming story are provided in **Table 4-17**. In summary the whale dreaming story relates to transmission of knowledge and connection between environment and people, the women’s lore and connection to whales through their heart centre and obligation to care for country. It is stated that "because each animal uses songlines for migration, breeding and feeding, the disruption or distortion to the songlines causes the animals to become disoriented, confused or lost.” Further, that the whale’s songline creates a path for other fauna to follow.

It is therefore expected that the whale songline has the potential to be affected by the Petroleum Activities Program where there are impacts to whales at a population level, including disruption of migration routes, permanent displacement of whales and population decline, that result in discontinuation of story/transmission of knowledge, and interruption of caring for Country activities, whale caretaker/midwife behaviour and to performance of song/ceremony onshore. Given potential impacts to whales are limited to behavioural disturbance to transient individuals, which are not considered to be ecologically significant at a population level, the whale songline and associated whale dreaming story is not anticipated to be affected by the Petroleum activities Program. Note further assessment of intangible values and marine mammals are provided below.

*Creation/dreaming sites; sacred sites; ancestral beings*

Woodside has undertaken all reasonable steps to identify creation and dreaming sites, sacred sites, and places associated with ancestral beings within the EMBA. No such sites have been

identified. A review of relevant literature has been undertaken which has identified creation, dreaming and ancestral narratives related to the sea more broadly without confirming where (if anywhere) these overlap the EMBA. These references are of a general nature, and do not identify any features or values requiring specific protection or management from the proposed activities.

In the literature reviewed, sea serpents or water serpents are common in Aboriginal creation narratives, and several references were identified. The majority of these refer to serpents residing within inland rivers or pools outside of the EMBA (Barber and Jackson 2011, Hayes v Western Australia [2008] FCA 1487, Juluwarlu 2004, Water Corporation 2019). In some versions, the serpent originates from the sea or coast and creates the rivers as it heads inland. The current coastline and past coastlines at various points along the Ancient Landscape—where the Serpent would have emerged onto the land—are all outside of the EMBA. Areas of the broader ocean where the serpent may have originally lived are not specified. Barber and Jackson (2011) also recount a story where a freshwater serpent pushes a sea serpent back into the ocean where it presumably continues to reside. This does not provide the specificity required to determine the location of sea serpents within the sea, and it is possible that the ocean as a whole (out to and beyond other continents) should be viewed generally as housing the sea serpent(s). Consultation with Traditional Custodians and ethnographic surveys have not identified impacts on sea serpents from the Petroleum Activities Program. However, by analogy to other water serpent narratives across Australia, possible impact pathways may include interruption of its path by blocking or reducing flows of water, damaging sacred sites such as thalu or rock art sites or depleting water sources.

No impacts to water flows (either tidal movement or ocean currents) or depletion of water sources are anticipated from this Petroleum Activities Program. The EMBA does not overlap the Ancient Landscape where thalu or rock art sites may exist.

*Cultural obligations to care for Country*

Caring for Country collectively refers to the cultural obligations of individuals and groups, as well as rituals and ceremonies required for the physical and spiritual health of the environment. Lack of access to coastally located cultural sites that carry songlines or remain ceremonially important can impact First Nations people's livelihoods and impact their ability to carry out cultural obligations on Country. The EMBA does not interact with coastal sites and no impacts to coastal sites of significance are anticipated.

No cultural activities to care for Country which are performed within the EMBA were identified.

*Knowledge of Country/customary law and transfer of knowledge*

Cultural knowledge about Sea Country/customary law and the intergenerational transmission of knowledge are important values identified through consultation, assessments and the literature review. Transfer of knowledge includes continuing traditional practices to pass on practical skills. No traditional practices conducted within the EMBA have been identified.

Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population—for example traditional fishing methods require the survival of traditional fish resources. Therefore, ensuring the transmission of cultural knowledge may require environmental controls protecting species and migratory pathways at a population level. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section 6.7 and 6.8 respectively.

*Connection to Country*

Connection to Country describes the multi-faceted relationship between First Nations people and the landscape, which is envisioned as having personhood and spirit. No impacts to connection to country are anticipated as a result of exclusion or displacement of Aboriginal communities. Access to Country is discussed below.

*Access to Country*

Access to Country, including Sea Country, is necessary for the continuation of other values including caring for Country and the transfer of traditional knowledge. Access is also a value in its own right, as a continuation of traditional Sea Country access and use.

Access to areas within the PAA may be limited where exclusion zones are established around vessels for safety purposes. The PAA is located greater than 215 km from the closest landfall at North West Cape and no traditional activities within the PAA have been identified. Further the exclusion zones around drilling activities are temporary and presence of subsea infrastructure are

not anticipated to affect navigation, particularly given the water depth. Access to Country within the EMBA is also not expected to be affected in the highly unlikely event of a marine diesel spill. However relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in **Appendix D**.

*Kinship systems and totemic species*

Individuals may have kinship to specific species (Smyth 2008, Juluwarlu 2004) and/or a responsibility to care for species (Muller 2008). These relationships are understood to impose obligations on Traditional Custodians. It is understood that these obligations do not impose restrictions on other people generally, but it is considered that impacts to species at a population level may inhibit Traditional Custodians with kinship relationships' ability to perform their obligations where this results in reduced or displaced populations. It is therefore considered that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals. As such, impacts to individual marine fauna is not expected to impact on the totemic or kinship cultural connection. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section 6.7 and 6.8 respectively.

*Resource collection*

A number of marine species are identified through consultation and literature as important resources, particularly as food sources. In addition to their immediate value as sustenance, the gathering and preparation of these resources are informed by cultural knowledge, and an inability to use these resources may result in a loss of ability to transfer that knowledge to future generations. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these communities may be impacted where there is an impact at the species/population level. Refer to species specific assessment below for further information, in addition to the impact assessment in Section 6.7.

Further, the closest boundary of the PAA is greater than 360 km west-north-west of Dampier, and greater than 215 km from the closest landfall at North West Cape, while the closest boundary of the EMBA is about 40 km from closest landfall with no shoreline contact. Impacts to potential resources within the EMBA are described and risk assessed in **Section 6.8**. Further relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in **Appendix D**.

***Marine Species***

*Marine mammals*

There are increase ceremonies / rituals for species of animals and plants, important to First Nations, to enhance or maintain populations. Thalu are places where these increase ceremonies are performed. All mentions of active ceremonial sites were confined to onshore locations, though the values may extend offshore where, for example, the thalu relates to marine species populations. As thalu ceremonies are performed to maintain and increase populations of marine species, it is considered that management applies at the species/population level and not to individuals—for example the thalu site on Murujuga which "brings in whales to beach" will continue to serve its purpose so long as whales continue to migrate through Mermaid Sound.

Related intangible cultural heritage may include the transmission of cultural knowledge about whales and whale behaviour, including birthing areas, whale communication and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn 2021). First Nations groups have expressed interest about whale migratory routes and studies (**Table 4-17**). Inter-generational transmission of cultural knowledge (including songlines) relating to marine mammals may be impacted where changes to population or behaviour at a population level results in reduced sightings (e.g., through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003).

As described in the relevant environmental impact and risk assessment **Sections 6.7** and **6.8** respectively, potential impacts to whales are limited to behavioural disturbance to transient individuals, which are not considered to be ecologically significant at a population level, and hence not expected to impact the value of marine mammals, including the transmission of cultural knowledge. The PAA does not overlap any BIAs, with the closest migratory BIA for pygmy blue

whales ~35 km distance away. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained.

*Marine reptiles*

Turtles and their eggs have been identified through consultation and existing literature as an important resource, particularly as food sources (**Table 4-16; Table 4-17**). Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level.

Intangible cultural heritage may also include the transmission of cultural knowledge about marine reptiles, such as nesting areas, hunting areas and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn 2021). First Nations groups have expressed an interest regarding turtle monitoring programs and migration patterns (**Table 4-17**). Activities that impact turtle populations and their marine environment may have an indirect impact on some Aboriginal communities as this can limit access to cultural sites or deplete hunting areas that would threaten local food security (Delisle et al. 2018:251). Inter-generational transmission of cultural knowledge (including Songlines) relating to marine reptiles may be impacted where changes results in reduced sightings (e.g., through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003).

As described in the relevant environmental impact and risk **Sections 6.7** and **6.8** respectively, potential impacts to marine reptiles are predicted to be at an individual level, which are not considered to be ecologically significant at a population level. Impacts will not occur to significant proportions of the populations of the species, nor result in a decrease of the quality of the habitat such that the extent of these species is likely to decline. Further, the PAA and EMBA do not overlap any marine turtle BIAs. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained.

*Fish*

Fish have been identified through consultation and existing literature as an important resource, particularly as food sources. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level.

During consultation, fish were identified as important agents in the management of the broader ecosystem in Mermaid Sound, which is outside of the EMBA, but is assumed to also apply general to marine environments Inter-generational transmission of cultural knowledge relating to fish may be impacted where changes to population/behaviour results in reduced sightings (e.g., through population decline). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003). Intangible cultural heritage associated with fish, including inter-generational knowledge regarding fishing techniques and migratory patterns, can be managed by reducing impacts to fish in nearshore marine environments to which this cultural knowledge is intrinsically connected.

As described in the relevant environmental impact and risk **Sections 6.7** and **6.8** respectively, it is expected that fish, sharks and rays may demonstrate avoidance or attraction behaviour however, potential impacts are not considered to be ecologically significant at a population level. The PAA and EMBA do not overlap any whale shark BIAs. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained.

***Conclusion***

The impact and risk assessment has determined that the planned activities are unlikely to result in an impact greater than negligible[43] (F) and unplanned activities are assessed to have a residual risk rating of moderate (or lower).

Woodside will continue to consider new heritage information as it becomes available (See C 4.9).

[43] Noting that as the receptor sensitivity is high the impact significance level is Slight (E).

| ALARP Demonstration | Control considered | Feasibility (F) & Cost/ Sacrifice (Cs) | Benefit in Impact/Risk Reduction | Proportionality | Adopted |
|---|---|---|---|---|---|
| | Apply a 'living heritage[44]' management approach. Woodside seeks advice and incorporates Traditional Custodian cultural knowledges across our activities. Cultural safety considerations are factored for our workforce and the Traditional Custodian community. | F: Yes<br>CS: Minimal | Implementation of the 'living heritage' approach pays acknowledgement and respect to Traditional Custodian communities. It supports the transfer of cultural knowledges and is an effective strategy to manage intangible cultural values. | Benefits outweigh cost/sacrifice. | Yes<br>**C 28.2** |
| | Implement a program, which is compliant with Corporate Woodside Policies Strategies and procedures, to undertake ongoing consultation with Traditional Custodians whose functions, interests and activities may be affected by the Petroleum Activities Program. | F: Yes<br>CS: Substantial costs | Implementation of this program is anticipated to allow Woodside to improve their understanding of potential cultural values and Heritage in the Operational Area and or EMBA and then develop avoidance or mitigation strategies in collaboration with Traditional Custodians if impacts to cultural values are identified. | Benefits outweigh cost/ sacrifice | Yes<br>**C 4.9** |
| | The environmental impacts and risks of the activity will continue to be managed to as low as reasonably practicable and an acceptable level for cultural features and heritage values. | F: Yes<br>CS: Substantial costs | Implementation of activities and associated controls to ALARP and acceptable levels supports the maintenance of cultural features and heritage values | Benefits outweigh cost/sacrifice | Yes<br>**C 28.1** |
| | Use of cultural heritage monitors on vessels to oversee implementation of controls protecting cultural values | F: No<br>CS: Not feasible | Primary Installation Vessels are POB constrained which depending on vessel has either no or limited ability to | Not considered – control not feasible. | No |

[44] Living heritage supports community and individual identity. Intangible cultural heritage is 'living heritage' that is inherited from ancestors and passed on to their descendants. It is comprised of many influences, including oral traditions, art, social practices, rituals and ceremonies, cultural knowledge and practices. It is transmitted from generation to generation, and evolves in response to the environment. Woodside applies a 'living heritage' approach to its cultural heritage management. This includes ensuring that Traditional Custodians are given voice to identify interests, transmit information and express concerns. Woodside works with Traditional Custodians to support and follow appropriate cultural protocols, including calling to Country, conducting smoking ceremonies (in areas where this custom is appropriate) and undertaking cultural awareness.

| | | | | | |
|---|---|---|---|---|---|
| | | | facilitate additional personnel.<br><br>On vessel cultural heritage monitors would have access to areas normally subject to exclusion zones and can shape the management of cultural features and heritage values in real time.<br><br>Within the PAA given the distance offshore it is likely not possible to reach agreement on which First Nations groups should be represented on vessels. | | |
| | Project inductions to all relevant marine crew, prior to the individual commencing the activity, will include information on cultural features and heritage values, including tangible and intangible cultural heritage. | F: Yes<br><br>CS: Minimal | Ensures workforce as suitably aware of cultural features and heritage values in the area they are operating. | Benefits outweigh cost/sacrifice. | Yes<br><br>**C 28.3** |
| | **C 3.1**<br><br>EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[45]:<br>• Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution zone) and not approach closer than 100 m from a whale.<br>• Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding).<br>• If the cetacean shows signs of being disturbed, project vessels will immediately | F: Yes<br><br>CS: Minimal | Implementation of controls for reduced vessel speed around marine fauna can potentially reduce the underwater noise footprint of a vessel and reduces the likelihood of impact or influence on whale activity. Where this control prevents impacts to whales at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained). | Benefits outweigh cost/sacrifice. | Yes<br><br>**C3.1** |

[45] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

| | | | | | |
|---|---|---|---|---|---|
| | withdraw from the caution zone at a constant speed of less than 6 knots. | | | | |
| | Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[46] | F: Yes<br>CS: Minimal | Implementation of controls for reduced vessel speed around marine fauna can potentially reduce the underwater whales at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained). | Benefits outweigh cost/sacrifice. | Yes<br>**C 3.5** |
| | Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone).<br>If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. | F: Yes<br>CS: Minimal | Implementation of controls for reduced vessel speed around marine fauna can potentially reduce the underwater noise footprint of a vessel and reduces the likelihood of impact or influence on turtle activity. Where this control prevents impacts to whales at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained). | Benefits outweigh cost/sacrifice. | Yes<br>**C 3.6** |
| | Implement adaptive management procedure prior to and during MODU /installation vessel moves to the next well location, during daylight hours. Adaptive management procedure to include:<br>• Use of trained crew (both MODU and installation vessel)<br>• Monitoring 30 minutes prior to move and during the | F: Yes<br>CS: Time / Cost associated with person used for observations Schedule delays associated with waiting on pygmy blue whale | Detecting pygmy blue whale and humpback whale activity in the area before MODU / installation vessel moves allows distance to be maintained and reduces the likelihood of impact or influence on pygmy blue whale or humpback whale activity. Where this control prevents impacts to whales at a population level, it | Benefits outweigh cost/sacrifice. | Yes<br>**C 3.2** |

[46] For safety reasons, the distance requirements are not applied for a vessel holding station or with limited manoeuvrability e.g. lifting, loading, back-loading, bunkering, close standby cover for overside working and emergency situations

| | | | | | |
|---|---|---|---|---|---|
| | transit to the new well location<br>• MODU / installation vessel will not approach within 500 m of any pygmy blue whales and humpback whales<br>Where pygmy blue whale or humpback whale presence has been observed the area will not be approached, within 500 m, until there has been a period of 30 minutes with no pygmy blue whale(s) or humpback whale recorded | and humpback whale activity to cease / move on. | maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained). | | |
| | Move support vessel(s) away from MODU (>2 km) if pygmy blue whale or humpback whale observed within 500 m – when support vessel is not being used to perform functionality as required by Safety Case | F: Yes<br>CS: Time / Cost associated with vessel moving and delay to activities which cannot be carried out without support vessel present and at required standby distance | Can reduce cumulative noise and potential reduction in likelihood of impact to pygmy blue whales and humpback whales. Where this control prevents impacts to whales at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained). | Benefits outweigh cost/sacrifice | Yes<br>**C 3.4** |
| | Should it be identified, that relevant cultural authorities may be affected in the unlikely event of a spill, Woodside will engage with those parties as appropriate and in alignment with the OSPRMA. | F: Yes<br>CS: Minimal | Engaging with relevant cultural authorities that may be impacted by a spill will allow the Traditional Custodians to identify areas of concern. | Benefits outweigh cost/sacrifice | Yes<br>Adopted, see **Appendix D** |
| | As marine ecosystems may hold both cultural and environmental value (see **Section 4.9.1**), with cultural and environmental values intrinsically linked, in addition to the above controls, the controls in **Section 6.7** and **6.8** will reduce impacts to cultural features and heritage values. | | | | |
| **ALARP Statement** | On the basis of the impact and risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, **Section 2.3.3**), Woodside considers the adopted controls appropriate to manage the potential impacts and risks to cultural features and heritage values. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP. | | | | |

**Acceptability Statement**

The impact and risk assessment has determined that, given the adopted controls, planned activities are unlikely to result in an impact greater than negligible (F)[47] and unplanned activities are assessed to have a residual risk rating of moderate (or lower).

The Petroleum Activities Program and the EMBA do not overlap the Ancient Landscape and they do not have a significant impact on MNES (**Section 6.7.5**) including marine fauna with a First Nations connection with, or traditional use in nearshore areas as defined in **Section 4.9.1**. Woodside has engaged with Traditional Custodians adjacent to the EMBA to understand the cultural features and heritage values that may occur and potential impacts from the activity. Additional controls considered and adopted, to minimise impacts to whales and associated songlines (C 3.2 and C3.4) have been discussed with the relevant persons who have raised the value.

The Program of Ongoing Engagement with Traditional Custodians (EPO 27 and C4.9) and 'living heritage' management approach (C 28.2) have been developed to enable Woodside to manage cultural values which may be identified at any time during Woodside's activities via ongoing dialogue with Traditional Custodians.

Further opportunities to reduce the impacts have been investigated above. The potential impacts and risks are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks to cultural features and heritage values to a level that is acceptable if ALARP.

**Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[48]**

| *EPO* | *Adopted Control(s)* | *EPS* | *MC* |
|---|---|---|---|
| **EPO 27**<br>Woodside will actively support Traditional Custodians' capacity for ongoing engagement and consultation on environment plans for the purpose of avoiding impacts to cultural heritage values<br>**EPO 28**<br>New cultural values identified through the Program and supporting studies (**EPO 27**) will be managed to ALARP and an Acceptable level of impact.<br>**EPO 29**<br>No impact to known cultural features and heritage value, as stated in Table 4-18, greater than a consequence level | **C 4.9**<br>Implement a program, which is compliant with Corporate Woodside Policies Strategies and procedures, to undertake ongoing consultation with Traditional Custodians whose functions, interests and activities may be affected by the Petroleum Activities Program. | **PS 4.9.1**<br>Implement a program, which is compliant with Corporate Woodside Policies, Strategies and procedures, to undertake ongoing consultation with Traditional Custodians whose functions, interests and activities may be affected by the Petroleum Activities program.<br>The Program may include, as agreed with relevant Traditional Custodians:<br>• Social investment to support First Nations ranger programs<br>• Support for First Nations oil spill response capabilities<br>• Support for recording Sea Country values<br>• Support to Traditional Custodian groups to build capabilities and | **MC 4.9.1**<br>Records demonstrate discussions with relevant Traditional Custodian Groups on proposed partnerships and/ or initiatives initiated by Woodside, and responses to feedback provided by Woodside within 4 weeks.<br>**MC 4.9.2**<br>Progress on the Program will be reported in line with annual sustainability reporting via the Woodside website. |

[47] Noting that as the receptor sensitivity is high the impact significance level is Slight (E).
[48] As marine ecosystems may hold both cultural and environmental value (see Section 4.9.1), with cultural and environmental values intrinsically linked, in addition to the specific controls for cultural features and heritage values, the controls and performance standards in section 6.7 and 6.8 will reduce impacts to cultural features and heritage values.

| Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[48] | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| of F[49] from the Petroleum Activities Program.<br><br>**EPO 3**<br>Undertake the Petroleum Activities Program in a manner that will not seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.<br><br>**EPO 4**<br>Undertake the Petroleum Activities Program in a manner that prevents a substantial adverse effect on a population of fishes, marine mammals, marine reptiles, or the spatial distribution of a population.<br><br>**EPO 8**<br>Undertake the Petroleum Activities Program in a manner that will not substantially modify, destroy or isolate an area of important habitat for a migratory species.<br><br>**EPO 21**<br>Undertake Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of marine mammals or the spatial distribution of the population.<br><br>**EPO 26**<br>Undertake the Petroleum Activities Program in a manner which prevents a vessel strike with | | capacity with respect to ability to engage with Woodside and the broader O&G industry on activities<br>• Development of ongoing relationships with Traditional Custodian groups<br>• Any other initiatives proposed for the purpose of protecting Country including cultural values | |
| | | Consideration of cultural values/ new information, through the life of the EP, and the development of avoidance or mitigation strategies in collaboration with Traditional Custodians if impacts to cultural values are identified. Where avoidance is not possible, impact minimisation will be prioritised and demonstrated through a written options analysis/ ALARP to ensure an acceptable level of impact. This will be documented through Woodside's Management of Change and Management of Knowledge processes. | **MC 4.9.3**<br>Records demonstrate Change Management and Management of Knowledge processes have been followed where new controls or management measures identified. |
| | | **PS 4.9.2**<br>Undertake an annual review of the program to determine its effectiveness and adapt the program accordingly. The annual review will also include an assessment of appropriateness of the methods used to undertake ongoing consultation with Traditional Custodians. | **MC 4.9.4**<br>Records demonstrate an annual review of the program has been undertaken. |
| | **C 28.2**<br>Apply a 'living heritage' management approach. Woodside seeks advice and incorporates Traditional Custodian cultural | **PS 28.2.1**<br>Woodside will continue to give voice to Traditional Custodians to identify interests, transmit information and express concern through | **MC 4.9.1**<br>Refer above |

[49] Defined as F – Negligible, no lasting effect (< 1 month) Localised impact not significant to areas /items of cultural significance

| Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[48] | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| protected marine fauna during project activities.<br><br>**EPO 20**<br>Undertake Petroleum Activities Program in a manner that will prevent a substantial adverse effect on a population of fish, or the spatial distribution of the population. | knowledges across our activities. Cultural safety considerations are factored for our workforce and the Traditional Custodian community. | Woodside's program as per PS 4.9.1. | |
| | | **PS 28.2.2**<br>Woodside will assess and where deemed practicable will implement appropriate cultural protocols where requested by Traditional Custodians | **MC 28.2.1**<br>Records demonstrate Woodside implemented cultural protocols as requested through PS 4.9.1. |
| | **C 28.1**<br>The environmental impacts and risks of the activity will continue to be managed to as low as reasonably practicable and an acceptable level for cultural values or features. | **PS 28.1.1**<br>Consideration of cultural values / new information, through the life of the EP, and the development of avoidance or mitigation strategies in collaboration with Traditional Custodians if impacts to cultural values are identified. Where avoidance is not possible, impact minimisation will be prioritised and demonstrated through a written options analysis / ALARP to ensure an acceptable level of impact. This will be documented through Woodside's Management of Change and Management of Knowledge processes. | **MC 28.1.1**<br>Records demonstrate Change Management and Management of Knowledge processes have been followed where new controls or management measures identified |
| | **C 28.3**<br>Project inductions to all relevant marine crew, prior to the individual commencing the activity, will include information on cultural features and heritage values, including tangible and intangible cultural heritage. | **PS 28.3.1**<br>All relevant marine crew have completed Project inductions, prior to the individual commencing the activity, that include information on cultural values, including tangible and intangible cultural heritage for awareness. | **MC 28.3.1**<br>Records demonstrate all relevant marine crew have completed inductions that include cultural material |
| | **C 3.1**<br>EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[50]:<br>• Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution zone) and not approach closer than 100 m from a whale. | **PS 3.1.1**<br>Refer to **Section 6.7.3** | **MC 3.1.1**<br>Refer to **Section 6.7.3** |

[50] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

| Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[48] | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | • Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding).<br>If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. | | |
| | **C 3.2**<br>Implement adaptive management procedure prior to and during MODU /installation vessel moves to the next well location, during daylight hours. Adaptive management procedure to include:<br>• Use of trained crew (both MODU and installation vessel)<br>• Monitoring 30 minutes prior to move and during the transit to the new well location<br>• MODU / installation vessel will not approach within 500 m of any pygmy blue whales and humpback whales<br>Where pygmy blue whale or humpback whale presence has been observed the area will not be approached, within 500 m, until there has been a period of 30 minutes with no pygmy blue whale(s) or humpback whale recorded. | **PS 3.2.1**<br>During moves to the next well location MODU or installation vessel will not approach within 500 m of pygmy blue whales or humpback whale or an area where pygmy blue whales or humpback whale were observed within the previous 30 minutes. | **MC 3.2.1**<br>Records demonstrate trained MODU/vessel crew on watch prior to moving to next well location<br>**MC 3.2.2**<br>Records demonstrate when PBW or humpback whale presence detected the MODU or installation vessel did not approach within 500 m. |
| | **C 3.4**<br>Move support vessel(s) away from MODU (>2 km) if pygmy blue whale or humpback whale observed within 500 m – when support vessel is not being used to perform functionality as required by Safety Case | **PS 3.4.1**<br>Support vessels relocate, where safety allows, from vicinity of the MODU when pygmy blue whale or humpback whale are observed within 500 m of the MODU. | **MC 3.4.1**<br>Records demonstrate support vessels relocated from MODU vicinity when cetacean activity identified. |
| | **C 3.5**<br>Project vessels will not travel greater than 6 knots within | **PS 3.5.1**<br>When within 250 m of a whale shark vessels will not travel | **MC 3.5.1**<br>Records demonstrate no breaches of speed |

| Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[48] | | | |
|---|---|---|---|
| ***EPO*** | ***Adopted Control(s)*** | ***EPS*** | ***MC*** |
| | 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[51] | greater than 6 knots and vessels will not approach closer than 30 m to a whale shark | requirements when within 250 m of a whale shark |
| | **C 3.6**<br>Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone).<br>If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. | **C 3.6.1**<br>When within 300 m of a turtle, vessels will not travel greater than 6 knots. | **MC 3.6.1**<br>Records demonstrate no breaches of speed requirements when within 300 m of a turtle |

[51] For safety reasons, the distance requirements are not applied for a vessel holding station or with limited manoeuvrability e.g. lifting, loading, back-loading, bunkering, close standby cover for overside working and emergency situations

# 7 IMPLEMENTATION STRATEGY

## 7.1 Overview

Regulation 14 of the Environment Regulations requires an EP to contain an implementation strategy for the activity. The implementation strategy for the Petroleum Activities Program confirms fit for purpose systems, practices and procedures are in place to direct, review and manage the activities so environmental risks and impacts are continually being reduced to ALARP and are acceptable, and that EPOs and standards outlined in this EP are achieved.

Woodside, as Operator, is responsible for ensuring the Petroleum Activities Program is managed in accordance with this Implementation Strategy and the WMS (see **Section 1.9**).

## 7.2 Systems, Practice and Procedures

All operational activities are planned and carried out in accordance with relevant legislation and standards, management measures (i.e. controls) identified in this EP and internal environment standards and procedures (**Section 6**).

The systems, practices and procedures that will be implemented are listed in the Performance Standards (PS) contained in this EP. Document names and reference numbers may be subject to change during the statutory duration of this EP and is managed through a Change Register and update process.

### 7.2.1 Assessment of Project Fluids

All chemicals that may be operationally released or discharged to the marine environment by the Petroleum Activities Program are evaluated using a defined framework and set of tools to ensure the potential impacts are acceptable, ALARP and meet Woodside's expectation for environmental performance.

All approved drilling and completion chemicals are included on the Drilling and Completions – Master Chemical List which is periodically reviewed to drive continuous environmental improvement.

The chemical assessment process follows the principles outlined in the Offshore Chemical Notification Scheme (OCNS) which manages chemical use and discharge in the United Kingdom (UK) and the Netherlands. It applies the requirements of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention). The OSPAR Convention is widely accepted as best practice for chemical management.

All chemical substances listed on the OCNS ranked list of registered products have an assigned ranking based on toxicity and other relevant parameters, such as biodegradation and bioaccumulation, in accordance with one of two schemes (as shown in **Figure 7-1**):

- Hazard Quotient (HQ) Colour Band: Gold, Silver, White, Blue, Orange and Purple (listed in order of increasing environmental hazard), or
- OCNS Grouping: E, D, C, B or A (listed in order of increasing environmental hazard). Used for inorganic substances, hydraulic fluids and pipeline chemicals only.

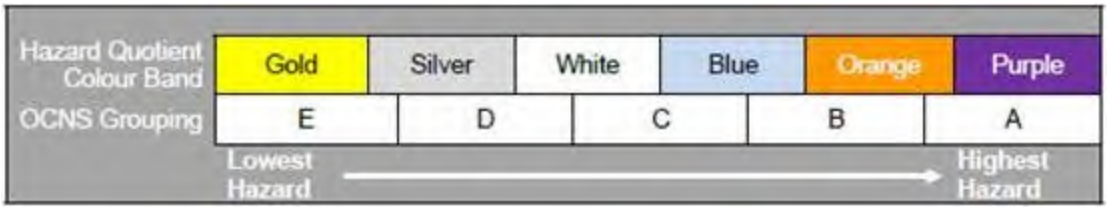


**Figure 7-1: OCNS ranking scheme**

Chemicals fall into the following assessment types:

- No further assessment: Chemicals with an HQ band of Gold or Silver or an OCNS ranking of E or D with no substitution or product warnings do not require further assessment. Such chemicals do not represent a significant impact on the environment under standard use scenarios and are, therefore, considered ALARP and acceptable.
- Further assessment/ALARP justification required: The following types of chemicals require further assessment to understand the environmental impacts of discharge into the marine environment:
  - chemicals with no OCNS ranking
  - chemicals with an HQ band of White, Blue, Orange, Purple or an OCNS ranking of A, B or C
  - chemicals with an OCNS product or substitution warning.

#### 7.2.1.1 Further Assessment/ALARP Justification

This includes assessing the ecotoxicity, biodegradation and bioaccumulation of the chemicals in the marine environment in accordance with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Hazard assessment and the Department of Mine and Petroleum (DMP) Chemical Assessment Guide: *Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline.*

##### *Ecotoxicity*

Chemical ecotoxicity is assessed using the criteria used by CEFAS to group chemicals based on ecotoxicity results (**Table 7-1**). If a chemical has an aquatic or sediment toxicity within the criteria for the OCNS grouping of D or E this is considered acceptable in terms of ecotoxicity.

**Table 7-1: CEFAS OCNS grouping based on ecotoxicity results**

| Initial grouping | A | B | C | D | E |
|---|---|---|---|---|---|
| Results for aquatic-toxicity data (ppm) | <1 | >1-10 | >10-100 | >100-1000 | >1000 |
| Result for sediment toxicity data (ppm) | <10 | >10-100 | >100-1000 | >1000-10,000 | >10,000 |

*Note: Aquatic toxicity refers to the Skeletonema constatum EC50, Acartia tonsa lethal concentration 50% ($LC_{50}$) and Scophthalmus maximus (juvenile turbot) $LC_{50}$ toxicity tests; sediment toxicity refers to Corophium volutator $LC_{50}$ test*

##### *Biodegradation*

The biodegradation of chemicals is assessed using the CEFAS biodegradation criteria, which align with the categorisation outlined in the DMP Chemical Assessment Guide: *Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline*.

CEFAS categorises biodegradation into the following groups:

- Readily biodegradable: results of >60% biodegradation in 28 days to an OSPAR harmonised offshore chemical notification format (HOCNF) accepted ready biodegradation protocol.
- Inherently biodegradable: results >20% and <60% to an OSPAR HOCNF accepted ready biodegradation protocol or result of >20% by OSPAR accepted inherent biodegradation study.
- Not biodegradable: results from OSPAR HOCNF accepted biodegradation protocol or inherent biodegradation protocol are <20%, or half-life values derived from aquatic simulation test indicate persistence.

***Bioaccumulation***

The bioaccumulation of chemicals is assessed using the CEFAS bioaccumulation criteria, which align with the categorisation outlined in the DMP Chemical Assessment Guide*: Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline.*

The following guidance is used by CEFAS:

- Non-bioaccumulative: LogPow <3, or BCF ≤100 and molecular weight is ≥700.
- Bioaccumulative: LogPow ≥3 or BC >100 and molecular weight is <700.

If a product has no specific ecotoxicity, biodegradation or bioaccumulation data available, the following options are considered:

- Environmental data for analogous products can be referred to where chemical ingredients and composition are largely identical. OR
- Environmental data may be referenced for each separate chemical ingredient (if known) within the product.

***Alternatives***

If no environmental data is available for a chemical or if the environmental data does not meet the acceptability criteria outlined above, potential alternatives for the chemical will be investigated, with preference for options with an HQ band of Gold or Silver, or OCNS Group E or D with no substitution or product warnings.

If no more environmentally suitable alternatives are available, further risk reduction measures (e.g. controls related to use and discharge) will be considered for the specific context and implemented where relevant to ensure the risk is ALARP and acceptable.

***Decision***

Once the further assessment/ALARP justification has been completed, the relevant environment adviser must concur that the environmental risk as a result of chemical use is ALARP and acceptable.

### 7.2.2 Woodside IMS risk assessment process

#### 7.2.2.1 Objective and scope

To minimise the risk of introducing IMS as a result of the Petroleum Activities Program, all applicable vessels and immersible equipment will be subject to Woodside's IMS risk assessment process (unless exempt as outlined below).

The objective of the risk assessment process is to identify the level of threat a contracted vessel, or immersible equipment poses if no additional risk reduction management measures are implemented. This allows Woodside (and its contractors) to apply management options that are commensurate to the identified level of risk.

In context of the activities specified in **Section 3**, the IMS risk assessment process does not apply to the following:

- Vessels or immersible equipment that do not plan to enter the IMS Management Area (IMSMA)[52] or operational areas defined in environmental approvals
- 'New build' vessels launched less than 14 days prior to mobilisation
- Vessels or immersible equipment which have been inspected by a suitably qualified IMS inspector who has classified the vessels or immersible equipment as acceptably low risk no more than 14 days prior to mobilisation
- Locally sourced vessels or immersible equipment from within the Pilbara locally sourced zone[53]. Vessels, or immersible equipment are defined as Locally Sourced when the same supply facilities/port have been used since their last IMS inspection, full hull clean in dry dock or application of antifouling coating (AFC[54]).

#### 7.2.2.2 Risk assessment process

Woodside's IMS risk assessment process was developed with regard to the national biofouling management guidelines for the petroleum production and exploration industry and guidelines for the control and management of a ships' biofouling to minimise the transfer of invasive aquatic species (IMO Guidelines, 2011).

In order to effectively evaluate the potential for vessels and immersible equipment to introduce IMS, a risk assessment process has been developed to score and evaluate the risk posed by each Project vessel, or immersible equipment planning to undertake activities within the IMSMA / Operational Area. The risk assessment process considers a range of factors, as listed in **Table 7-2** and **Table 7-3.**

The IMS risk assessments will be undertaken by a trained environment adviser who has completed relevant Woodside IMS training or by a qualified and experienced IMS inspector. A QA/QC process is implemented for all Woodside conducted IMS risk assessments where a secondary trained environment adviser verifies the assessment to minimise the risk of misapplication and errors within the risk assessment process.

**Table 7-2: Key factors considered as a part of the risk assessment process for vessels**

| Factors | Details |
|---|---|
| Vessel type | The risk of IMS infection varies depending on the type of vessel undertaking the activity. A higher risk rating is applied for more complex, slow-moving vessels (e.g., dredges) in comparison to simple vessels (e.g., crew transfer vessel). |

[52] IMSMA is based on current legal framework and includes all nearshore waters around Australia, extending from the lowest astronomical tide mark to 12 nm from land (including Australian territorial islands). The IMSMA also includes all waters within 12 nm from the 50 metre depth contour outside of the 12 nm boundary (i.e. Submerged reefs and atolls).

[53] The Pilbara Zone includes Port, nearshore and offshore movements between Exmouth and Port Headland (excluding high environmental value areas, World Heritage Areas, Commonwealth Marine Reserve Sanctuary Zones and State Marine Management Areas and Marine Parks).

[54] Vessels and immersible equipment can still be classified as locally sourced even if the AFC application occurred in a different port provided the amount of time between AFC application and departure to the locally sourced area (i.e. period of time in waters <12nm/50m water depth) did not exceed consecutive 7 days or the period of time the vessel or immersible equipment has spent within the locally sourced zone exceeds 1 year (i.e. the risk of introducing a species from a different location has already passed).

| Factors | Details |
|---|---|
| Recent IMS inspection and cleaning history, including for internal niches | In the case of biofouling on external hull niches, different risk ratings are applied dependant on whether out-of-water or in-water IMS inspections by qualified IMS inspectors and cleaning (if required) have been undertaken prior to contract commencement. If an IMS inspection (and clean if required) has not been undertaken in the past six months (from the time of contract commencement), the highest risk factor is applied. The risk factor then lessens for vessels as the time between inspection and mobilisation reduces. |
| Out-of-water period before mobilisation | A risk reduction factor can be applied for vessels that are hauled out and then mobilised as deck cargo or by road during mobilisation, therefore becoming air dried over an extended period. Risk reduction factor increases with exposure time out of water. |
| Age and suitability of AFC at mobilisation date | AFC manufacturers provide a range of coatings, each designed to avoid premature coating failure if it is correctly applied and matched to the vessel's normal speeds and activity profile (i.e., proportion of time spent stationary or below three knots), and its main operational region (i.e., tropical, sub-tropical temperate). If the AFC type is deemed to be unknown, unsuited or absent, the highest risk value is applied. If the AFC type is suitable the risk factor applied reduces with age since application. |
| Internal treatment systems | A risk reduction factor applied if the vessel has an internal biological fouling control system in place at the time of assessment, or evidence of manual dosing. |
| Vessel origin and proposed area of operation | Differing risk ratings are assigned in relation to the climatic relationship between the vessel's origin and the proposed climatic region of the proposed area of operation. Highest risk rating is applied to similar climatic regions. |
| Number of stationary/slow speed periods >7 days | A risk factor is calculated based on the number of 7 day periods that the vessel has operated at stationary or at low speed (less than three knots) in port or coastal waters which is any waters less than 50 metres deep outside 12 nautical miles from land or any waters within 12 nautical miles of land. The greater the number of periods the higher the risk factor applied. |
| Region of stationary or slow periods | A further multiplier is applied depending on the location of the stationary/slow speed periods. The highest risk rating applied if the stationary or slow speed periods occurred within ports or coastal waters of the same climatic region, |
| Type of activity – contact with seafloor. | The potential for the introduction of IMS varies on the planned vessel activity taking place. Those activities that come in contact with sediments and thus have the potential to accumulate and harbour IMS in areas such as hoppers (dredges) and spud cans (drilling rigs) are considered to have a greater risk of infection. |

**Table 7-3: Key factors considered as a part of the risk assessment process for immersible equipment**

| Factors | Details |
|---|---|
| Region of deployment since last thorough clean, particularly coastal locations | Climatic region of use since last overhaul, thorough cleaning or prolonged period out of water (>28 day). Highest risk rating is applied to similar climatic regions. Activities occurring in nearshore areas (less than 50 meters deep and/or within 12 nautical miles from land) are given the highest risk rating. |
| Duration of deployments | Maximum duration of deployment (maximum time in water) since last overhaul or thorough cleaning. The longer the period of immersion the higher the risk rating applied. |
| Duration of time out of water since last deployment | A further risk reduction factor can be applied for immersible equipment that has been out of the water for an extended period. |
| Transport conditions during mobilisation | If the equipment is stored in damp conditions then a high risk factor is applied, while if equipment is stored in dry and well ventilated (low humidity) conditions then a low risk factor is applied. |
| Post-retrieval maintenance regime. | A risk reduction factor is applied if the equipment/item of interest is routinely washed, cleaned, checked and/or dissembled between project sites. While a higher risk rating is applied where no routine cleaning occurs. |

Following implementation of the risk assessment process, vessels and/or immersible equipment are classified as one of three risk categories, as defined below.

- 'Low'– Low risk of introducing IMS of concern and hence no additional management required, or management options have been applied to reduce the risk.
- 'Uncertain'– Risk of introducing IMS is not apparent and as such the precautionary approach is adopted, and additional management options may be required.
- 'High'– High risk of introducing IMS means additional management options are required prior to this vessel mobilising to the Operational Area.

Following the allocation of a 'low' risk rating for a vessel or immersible equipment, the information provided by the vessel operator for the purposes of risk assessment must be confirmed prior to mobilisation. For vessels or equipment classified as posing an 'uncertain' or 'high' theoretical risk, a range of management options are presented to reduce this theoretical risk to acceptable levels and achieve a low risk status. These management options have been developed with the intention of reducing IMS risk to levels that are as low as reasonably practicable (i.e., ALARP). It is a flexible approach that allows for a range of management actions to be tailored for a specific vessel movement. These will be assessed on a case-by-case basis and may include, but not limited to, the following:

- Inspection (desktop, in-water or dry dock) by a suitably qualified and experienced IMS inspector to verify risk status. Where practicable, the inspection shall occur within seven days (but not more than 14 days) prior to final departure to the Operational Area.
- In-water or dry dock cleaning of the hull and other niche areas. This is typically applied where the risk assessment outcome is High risk driven by the age of the AFC on the vessel and its time spent in similar climatic region ports.
- Treatment of vessels internal seawater systems. This is typically applied in isolation for vessels with AFC applied to their hull within the last twelve months and where subsequent assessment through the process achieves a Low risk rating.
- Limiting the duration that the vessel spends within the IMSMA to a maximum of 48 hours (cumulative entries)[55]. This is applicable for Uncertain risk vessels only.
- Reject the vessel.

Project vessels and immersible equipment are required to be a low risk of introducing IMS prior to entering the Operational Area.

## 7.3 Roles and Responsibilities

Key roles and responsibilities for Woodside and contractor personnel relating to implementing, managing and reviewing this EP are described in **Table 7-4**. Roles and responsibilities for oil spill preparation and response are outlined in **Appendix D** and the *Woodside Oil Pollution Emergency Arrangements (Australia)*.

It is the responsibility of all Woodside employees and contractors to implement the Woodside *Corporate Health, Safety, Environment and Quality Policy* (**Appendix A**) in their areas of responsibility and that the personnel are suitably trained and competent in their respective roles.

[55]48 hours is considered an appropriate and ALARP management control, as it significantly reduces the potential for any IMS associated with a vessel to successfully establish suitable habitat within the IMSMA. This reduction of risk is primarily achieved via a direct reduction of the propagule pressure associated with a particular vessel movement.

**Table 7-4: Roles and responsibilities**

| Title (role) | Environmental Responsibilities |
|---|---|
| ***Office-based Personnel*** | |
| Woodside Project Manager | • Monitor and manage the activity so it is undertaken as per the relevant standards and commitments in this EP.<br>• Notify the Woodside Environment Adviser of any scope changes in a timely manner.<br>• Liaise with regulatory authorities as required.<br>• Review this EP as necessary and manage change requests.<br>• Ensure all project and support vessel crew members complete an HSE induction.<br>• Verify that contractors meet environmental related contractual obligations.<br>• Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's Health, Safety and Environment Reporting and Investigation Procedure.<br>• Monitor and close out corrective actions identified during environmental monitoring or audits. |
| Woodside Well Delivery Manager | • Ensure drilling operations are undertaken as per this EP and approval conditions.<br>• Provide sufficient resources to implement the drilling-related management measures (i.e. controls, EPOs, PSs and MC) in this EP.<br>• Ensure MODU and support vessel personnel are given an Environmental Induction as per **Section 7.6.2** of this EP at the start of the drilling programs.<br>• Confirms controls and performance standards in this EP are actioned, as required, before drilling commences.<br>• Ensures the MODU start-up meets the requirements of the Drilling and Managing Rig Operations Process. |
| Woodside Subsea and Pipelines Installation Manager | • Ensure the subsea installation activities are undertaken as per this EP and approval conditions.<br>• Provide sufficient resources to implement the subsea installation-related management measures (i.e. controls, EPOs, PSs and MC) in this EP.<br>• Ensure installation vessel personnel are given an Environmental Induction as per **Section 7.6.2** this EP at the start of the installation activities.<br>• Confirm controls and performance standards in this EP are actioned, as required, before installation activities commence.<br>• Ensure relevant vessels meet the requirements of Woodside's Marine Operations Operating Standard.<br>• Manage change requests for the activity and notify the Woodside Environment Adviser of any scope changes in a timely manner.<br>• Confirm that site-based personnel are given an Environmental Induction as per **Section 7.6.2** of this EP at the start of the activity.<br>• Ensure all chemicals and drill fluids proposed to be discharged are assessed and approved as per the requirements of the EP. |
| Woodside Drilling Superintendent | • Ensure the drilling program meets the requirements detailed in this EP.<br>• Ensure changes to the drilling program are communicated to the Woodside Environmental Adviser.<br>• Ensure the Woodside's Well Site Manager is provided with the resources required to ensure the management measures (i.e. controls, EPOs, EPs and MC) in this EP are undertaken. |

| Title (role) | Environmental Responsibilities |
|---|---|
| | • Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's Health, Safety and Environment Reporting and Investigation Procedure.<br>• Monitor and close out corrective actions identified during environmental monitoring or audits. |
| Woodside Drilling Engineers | • Ensure changes to the drilling program are communicated to the Woodside Environmental Adviser.<br>• Ensure all drill and completions fluid chemical components and other fluids that may be used downhole have been reviewed by the Drilling and Completions Environmental Adviser. |
| Woodside Environmental Adviser | • Verify relevant Environmental Approvals for the activities exist prior to commencing activity.<br>• Track compliance with performance outcomes and performance standards as per the requirements of this EP.<br>• Prepare environmental component of relevant Induction Package.<br>• Assist with the review, investigation and reporting of environmental incidents.<br>• Ensure environmental monitoring and inspections/audits are undertaken as per the requirements of this EP.<br>• Liaise with relevant regulatory authorities as required.<br>• Assist in preparation of external regulatory reports required, in line with environmental approval requirements and Woodside incident reporting procedures.<br>• Monitor and close out corrective actions (Campaign Action Register (CAR)) identified during environmental monitoring or audits.<br>• Provide advice to relevant Woodside personnel and contractors to assist them to understand their environment responsibilities.<br>• Liaise with primary installation contractors to ensure communication and understanding of environment requirements as outlined in this EP and in line with Woodside's Compass values and management systems. |
| Woodside Corporate Affairs Adviser | • Prepare and implement the Consultation Plan for the Petroleum Activities Program.<br>• Report on consultation.<br>• Ongoing liaison and notification as required as per **Section 7.8**. |
| Woodside Marine Assurance Superintendent | • Conducts relevant audit and inspection to confirm vessels comply with relevant Marine Orders and Woodside Marine Charters Instructions requirements to meet safety, navigation and emergency response requirements. |
| Woodside CICC Duty Manager | On receiving notification of an incident, the Woodside CICC Duty Manager shall:<br>• establish and take control of the IMT and establish an appropriate command structure for the incident<br>• assess situation, identify risks and actions to minimise the risk<br>• communicate impact, risk and progress to the Crisis Management Team and stakeholders<br>• develop the incident action plan (IAP) including setting objectives for action<br>• approve, implement and Manage the IAP |

| Title (role) | Environmental Responsibilities |
|---|---|
| | • communicate within and beyond the incident management structure<br>• manage and review safety of responders<br>• address the broader public safety considerations<br>• conclude and review activities. |
| ***MODU-based Personnel*** | |
| MODU Offshore Installation Manager (OIM) | • Ensure the MODU's management system and procedures are implemented.<br>• Ensure personnel starting work on the MODU receive an environmental induction that meets the requirements specified in this EP.<br>• Ensure personnel are competent to undertake the work they have been assigned.<br>• Verify that emergency drills are conducted as per the MODU's schedule.<br>• Ensure the MODU's Emergency Response Team has been given sufficient training to implement the MODU's SOPEP.<br>• Ensure any environmental incidents or breaches of outcomes or standards are reported immediately to the Well Site Manager.<br>• Ensure corrective actions for incidents or breaches are developed, communicated to the Well Site Manager, and tracked to close out in a timely manner. Close out of actions is communicated to the Well Site Manager. |
| Woodside Well Site Manager | • Ensure the drilling program is undertaken as detailed in this EP.<br>• Ensure the management measures (i.e. controls, EPOs, PSs and MC) detailed in this EP (relevant to offshore activities) are implemented on the MODU (other controls will be implemented onshore).<br>• Ensure environmental incidents or breaches of outcomes or standards are reported as per the Woodside Corporate Event Notification Matrix. Corrective actions for incidents and breaches are developed, tracked and closed out in a timely manner.<br>• Ensure actions in the Drilling and Completions HSE Improvement Plan are undertaken.<br>• Ensure periodic environmental inspections/reviews are completed. Corrective actions from inspections are developed, tracked and closed out in a timely manner. |
| Woodside Offshore HSE Adviser | • Support the Well Site Manager to ensure the controls detailed in this EP relevant to offshore activities are implemented on the MODU and help collect and record evidence of implementation (other controls are implemented, and evidence collected onshore).<br>• Support the Well Site Manager to ensure the Environmental Performance Outcomes are met and the performance standards detailed in this EP are implemented on the MODU.<br>• Confirm actions in the Drilling and Completions HSE Improvement Plan are undertaken.<br>• Support the Well Site Manager to ensure environmental incidents or breaches of outcomes or standards outlined in this EP, are reported, and corrective actions for incidents and breaches are developed, tracked and closed out in a timely manner.<br>• Ensure periodic environmental inspections/reviews are completed and corrective actions from inspections are developed, tracked and closed out in a timely manner. |

| Title (role) | Environmental Responsibilities |
|---|---|
| | • Review Contractors procedures, input into Toolbox talks and JSAs.<br>• Provide day to day environmental support for activities in consultation with the Woodside Environment Adviser. |
| Drilling Logistics Coordinator | • Waste is managed on the MODU and sent to shore as per the Drilling and Completions Waste Management Plan. |
| ***Vessel-based Personnel*** | |
| Installation Vessel Master<br>Activity Support Vessel Master | • Ensure the vessel management system and procedures are implemented.<br>• Ensure personnel commencing work on the vessel receive an environmental induction that meets the relevant requirements specified in this EP.<br>• Ensure personnel are competent to undertake the work they have been assigned.<br>• Verify SOPEP drills are conducted as per the vessel's schedule.<br>• Ensure the vessel Emergency Response Team (ERT) has been given sufficient training to implement the SOPEP.<br>• Ensure any environmental incidents or breaches of relevant Environmental Performance Outcomes or performance standards detailed in this EP, are reported immediately to the Woodside Well Site Manager.<br>• Ensure corrective actions for incidents or breaches are developed, communicated to the Well Site Manager, and tracked to close out in a timely manner. Close out of actions is communicated to the Well Site Manager. |
| Vessel Logistics Coordinators | • Ensure waste is managed on the relevant support vessels or installation vessel and sent to shore as per the relevant Waste Management Plan. |
| Vessel HSE Advisers | • Refer to Woodside HSE Offshore Adviser responsibilities detailed above under MODU-based personnel. |
| Contractor Project Manager | • Confirm that activities are undertaken in accordance with this EP, as detailed in the Woodside approved Contactor Environmental Management Plan<br>• Ensure personnel commencing work on the project receive a relevant environmental induction that meets the requirements specified in this EP<br>• Ensure personnel are competent to undertake the work they have been assigned<br>• Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP, are reported immediately to the Woodside Responsible Engineer or Vessel Master. |
| Woodside Site Representative/ Resident Engineer | • Ensure activities are undertaken as detailed in this EP.<br>• Ensure the management measures made in this EP are implemented on the vessel<br>• Ensure environmental incidents or breaches of objectives, standards or criteria outlined in this EP, are reported as per the Woodside Corporate Event Notification Matrix<br>• Verify HSE improvement actions identified during the project are implemented where practicable<br>• Ensure periodic environmental inspections are completed. |

## 7.4 Unexpected Finds Procedure

In the event of the discovery of what appears to be Underwater Cultural Heritage (defined as 'any trace of human existence that has a cultural, historical or archaeological character and is located under water'); the following Unexpected Finds Procedure will apply:

- All activities with the potential to impact the suspected Underwater Cultural Heritage must cease immediately. Retain all records of the potential Underwater Cultural Heritage including any imagery, description and location.
- Person who discovers the heritage object must inform the Activity Supervisor.
- Activity Supervisor must notify Woodside's Principal Heritage Adviser.
- Woodside will specify an appropriate buffer around the potential Underwater Cultural Heritage, taking into consideration the nature and scale of the potential Underwater Cultural Heritage and the activities to be managed.
- No seabed disturbance may occur within the buffer area around the potential Underwater Cultural Heritage until approved by Woodside's Principal Heritage Adviser.
- Woodside's Principal Heritage Adviser must notify a qualified maritime archaeologist and provide all available documentation of the potential Underwater Cultural Heritage.
- If the potential Underwater Cultural Heritage appears to be Aboriginal Underwater Cultural Heritage, Woodside's Principal Heritage Adviser must notify the appropriate Traditional Custodians to determine whether it is a heritage site and if so, how the site should be managed.
- If the potential Underwater Cultural Heritage appears to be a shipwreck or aircraft that has been wrecked for more than 75 years, or is otherwise reportable under Section 40 of the UCH Act, Woodside's Principal Heritage Adviser must notify the Minister responsible for the UCH Act, the DCCEEW underwater archaeological section through the Australasian Underwater Cultural Heritage Database, and the Western Australian Museum.
- If the suspected heritage object includes human remains, Woodside's Principal Heritage Adviser must also notify:
    - the Australian Federal Police (phone: 131 444) of the location of the remains, that the remains are likely to be historic or Aboriginal in origin, and that it may be appropriate that Traditional Custodians and a maritime archaeologist are present during any handling of the remains; and
    - the Office of the Federal Environment Minister in accordance with Section 20 of the ATSIHP Act
- Work must not recommence in the vicinity of the heritage object until Woodside's Principal Heritage Adviser provides written approval. Woodside's Principal Heritage Adviser must only provide written approval once agreed management measures are implemented consistent with approvals and legislation or where the potential Underwater Cultural Heritage is confirmed to not be Underwater Cultural Heritage.

## 7.5 Thalanyji Sea Country Management Process

During consultation, BTAC, on behalf of the Thalanyji People, advised it has a cultural obligation to care for the environmental values of Sea Country (refer to **Appendix F**, Table 1).

In correspondence from 20 February 2023 relating to the Scarborough Project, BTAC advised that:

- BTAC seeks support from Woodside to enable BTAC to define and articulate its values on Sea Country in a manner that could be more clearly understood by the offshore sector, government, and the community. This would enable BTAC and Woodside to collaborate to develop effective management plans that can provide adequate protection to Sea Country values; and
- BTAC seeks support from Woodside to obtain technical support to review the information and provide BTAC and its members with feedback on the project risks to Sea Country and help BTAC contemplate the potential management controls that could be developed to protects its values and interests.

Woodside's offer of technical support is detailed in **Appendix F**, Table 1, but this has not yet been accepted.

A review of publicly available literature has been undertaken to seek clarity on the extent of Sea Country for Thalanyji people (**Section 4.9.1.5.3**).

The publicly available information considered does not record any instances of Thalanyji sea country extending beyond the Montebello Multiple Use Zone within the vicinity of the islands.

There are no credible planned or unplanned impacts to the Montebello Islands, Barrow Island or the Mackerel Islands or the Montebello Marine Park Multiple Use Zone, or the islands indicated in WC1999/045. They are outside the EMBA for the activity.

Woodside has developed a robust understanding of Thalanyji Sea Country cultural values and heritage features through publicly available information (**Section 4.9.1.5.3**) and consultation with BTAC under Regulation 11A. Woodside considers that it has taken all reasonable steps to identify cultural features and heritage values of Thalanyji people in the EMBA.

If further guidance from BTAC is received as part of ongoing consultation which changes Woodside's understanding of the extent of Thalanyji Sea Country, Woodside's Management of Change and Management of Knowledge process with EPO 28 will be applied to manage potential impact to newly identified cultural values or features to ALARP and Acceptable levels. This estimation does not limit the extent of consultation with BTAC or the features and values they are encouraged to identify and communicate.

Woodside will implement the process in **Table 7-5** to ensure all reasonable steps have been taken to identify sea country values relative to BTAC through ongoing consultation.

**Table 7-5: BTAC ongoing consultation**

| Activity | Timing |
|---|---|
| Woodside contacted BTAC to discuss the best way forward to consult with BTAC | Completed<br>January 2023 |
| Woodside and BTAC commenced correspondence regarding a consultation or engagement framework, including financial resourcing for BTAC | Ongoing since<br>February 2023 |
| BTAC confirmed that subject to formalising arrangements – for example under a collaboration agreement - BTAC agrees in principle for Woodside to include the statements described in the letter from Woodside dated 17 March. | Completed<br>18 April 2023 |
| BTAC requested Woodside provide a draft presentation for BTAC's board regarding Woodside's activities on Thalanyji country, and draft key terms / key principles regarding a Collaboration Agreement | Completed<br>4 May 2023 |
| Woodside provided to BTAC a draft of principles for a consultation framework, targeting having the framework agreed and in place by 31 July 2023 | Completed<br>14 June 2023 |
| Woodside wrote to BTAC inviting BTAC to submit a cost estimate to continue consultations and address items in the draft framework principles, in the interim whilst the framework is being agreed | Completed<br>14 July 2023 |

| Activity | | Timing |
|---|---|---|
| BTAC wrote to Woodside regarding the draft framework principles and proposed to forward Woodside a Costs Acceptance Letter to address resourcing for ongoing consultation | | Completed<br>19 July 2023 |
| Woodside provided BTAC with a draft presentation for BTAC's board, including a map showing a consolidated EMBA - a consolidation of all single activity EMBAs that have been notified to BTAC to date | | Completed<br>20 July 2023 |
| 1 | Woodside requested an ethnographic assessment to be undertaken by BTAC, including:<br>• That the scope of works identifies the values of sea-country generally sufficient to inform all Woodside EPs;<br>• That Woodside will cover all reasonable costs of this assessment, to be agreed upon receipt of a cost estimate from BTAC;<br>• That, in order to ensure the independence of any assessment and confidence in the process and consultants, Woodside's preference is for BTAC to manage the assessment, including selection of any consultant, but acknowledging the constraints on BTAC's time and resources that where directed Woodside (or a consultant) is willing to provide in-kind support for the assessment, including some or all tasks required to coordinate the assessment;<br>• That any resulting report or other materials will remain the intellectual property of BTAC, but that Woodside will retain a perpetual right to use the content of any non-culturally sensitive report or other materials produced for the purposes of project approvals and planning, including providing these in-full to regulators and government authorities as needed, and that where culturally sensitive reports or other materials are produced a non-culturally sensitive (redacted or edited) version will pe provided subject to the same perpetual right above; and<br>• To minimise the burden of duplication on BTAC and allow prioritisation of this assessment any results of this assessment may be shared by BTAC with other proponents, and where other proponents require ethnographic assessment outside of the proposed scope but aligned with the assessment timeframes, the engaged consultants may perform the required additional work (including additional days of research, fieldwork etc.) as an extension of this assessment at the cost of those proponents (thus avoiding duplication of time and costs relating to logistics, administration etc.)<br>• Reiterate commitment to undertaking ethnographic assessments with BTAC, at BTAC's earliest availability. | July 2023<br>Follow up after 2 weeks and once monthly in September and October. |
| 2 | Woodside will continue to implement its Management of Change and Management of Knowledge processes where new information is communicated from BTAC (including as a result of the ethnographic survey proposed in item 1) at any time.<br>• Seek to consult with BTAC on any identified cultural values and relevant management and mitigation measures<br>• Implement PS 28 which manages potential impact to newly identified cultural values or features to ALARP and Acceptable Levels | Within 14 days of new cultural values being communicated from BTAC |
| 3 | Ongoing consultation as per Ongoing Program of Traditional Owner Consultation | Per Ongoing Program |
| 4 | Building capacity for the ongoing protection of country, including initiatives agreed with BTAC for the articulation of values on Sea Country in a manner that could be more clearly understood by the offshore sector, government, and the community. | Per Ongoing Program |
| Woodside notified BTAC of the planned start date of the activity, again providing information about the activity and requesting any further information on cultural features and/or heritage values prior to a date specified.<br>Woodside notified BTAC of the planned start date of the activity, again providing information about the activity and requesting any further information on cultural features and/or heritage values prior to a date specified, to be considered in ongoing consultation. PS28 will be implemented to manage potential impact to newly identified cultural values or features to ALARP and Acceptable Levels. | | 14 September |
| In absence of further response from BTAC, Woodside has undertaken desktop research to: | | - |

| Activity | Timing |
|---|---|
| • Identify Indigenous cultural features and heritage values off the WA coastline (**Section 4.9.1.5.3**)<br>• Clarify the extent of Thalanyji sea country (**Section 4.9.1.5.3**)<br>PS28 will be implemented to manage potential impact to newly identified cultural values or features to ALARP and Acceptable Levels | |

## 7.6 Training and Competency

### 7.6.1 Overview

Woodside as part of its contracting process undertakes assessments of a proposed Contractor's environmental management system to determine the level of compliance with the standard AS/NZS ISO 14001. This assessment is undertaken for the Petroleum Activities Program as part of the pre-mobilisation process. The assessment determines whether there is a clearly defined organisational structure that clearly defines the roles and responsibilities for key positions. The assessment also assesses whether there is an up-to-date training matrix that defines any corporate and site/activity-specific environmental training and competency requirements.

As a minimum, environmental awareness during inductions is required for all MODU personnel, detailing awareness and compliance with the MODU and project vessel Contractor's environmental policy and environmental management system.

### 7.6.2 Inductions

Inductions are provided to all relevant personnel (e.g. contractors and Company representatives) before mobilising to or on arrival at the activity location. The induction covers the HSE requirements and environmental information specific to the activity location. Attendance records will be maintained.

The Petroleum Activities Program induction may cover information about:

- Description of the activity.
- Ecological and socio-economic values of the activity location, including an overview of pygmy blue whales.
- Regulations relevant to the activity.
- Woodside's Environmental Management System – Health, Safety and Environment Policy.
- EP importance/structure/implementation/roles and responsibilities.
- Main environmental aspects/hazards and potential environmental impacts and related performance outcomes.
- Oil spill preparedness and response.
- Monitoring and reporting on performance outcomes and standards using MC.
- Incident reporting.

In addition, the inductions will cover the requirement that there will be no recreational fishing from the MODU and / or vessels.

### 7.6.3 Activities Program Specific Environmental Awareness

Before petroleum activities begin, a pre-activity meeting will be held on-board the MODU and project vessels with all relevant personnel. The pre-activity meeting provides an opportunity to reiterate specific environmental sensitivities or commitments associated with the activity. Relevant sections

of the pre-activity meeting will also be communicated through to the support vessel personnel. Attendance lists are recorded and retained.

During operations, regular HSE meetings will be held on the MODU and project vessels which cover all crew. During these meetings, recent environmental incidents are regularly reviewed, and awareness material presented.

### 7.6.4 Pygmy Blue Whale Observation Training

Relevant crew onboard the MODU and installation vessels will undertake PBW observation training prior to commencing activities. Woodside and Contractor personnel will be trained to deliver the PBW training ('train-the-trainer' model) by an external organisation specialising in marine environmental training, with expertise in marine fauna observations. Training materials will be developed by the external organisation in consultation with WEL, to ensure Project specific information is incorporated. The bespoke training package will cover:

- An overview of Scarborough Project activities and the cetaceans that may be present during these activities
- An overview of the potential impacts and risks to PBW
- an overview of EP controls and management procedures relevant to PBW presence
- different types of PBW behaviours inc. the difference between foraging and migrating, and how to identify these based on the latest information on persistence in the area, dive time and swimming speed (Owen et al. 2016; AIMS unpublished data 2021; Thums & Ferreira 2021)
- precautionary approach to identification i.e. assume PBW if positive ID of different species type not possible;
- the observation and reporting requirements.

When trained crew are undertaking observations, expectations are that:

- Observation equipment / tools are used as required (i.e. range-finding binoculars, whale ID prompts etc.)
- Escalation process carried out if PBW are identified including alerting bridge crew so that appropriate response can be initiated
- Make and maintain records including the date, time and approximate distance from the vessel, and the action taken to comply with EPS

Records will be maintained as evidence of the personnel who have completed PBW observation training.

Completion of PBW Observation Training is a minimum requirement for those performing observations relevant to adaptive management measures in this EP (such as C 3.2, C 3.3 and C 3.4).

For any trained crew who haven't conducted PBW observations for greater than 12 months, refresher training is required prior to undertaking the role.

### 7.6.5 Management of Training Requirements

All personnel on the MODU and project vessels are required to be competent to perform their assigned positions. This may be in the form of external or 'on the job' training. The vessel Safety Training Coordinator (or equivalent) is responsible for identifying training needs, keeping records of training performed and identifying minimum training requirements.

## 7.7 Monitoring, Auditing, Management of Non-conformance and Review

### 7.7.1 Monitoring

Woodside and its contractors will perform a program of periodic monitoring during the Petroleum Activities Program – starting at mobilisation of each activity and continuing through the duration of each activity to activity completion. This information will be collected using the tools and systems outlined below, developed based on the EPOs, controls, standards and MC in this EP. The tools and systems will collect, as a minimum, the data (evidence) referred to in the MC in **Section 6** and **Appendix D**.

The collection of this data (against the MC) will form part of the permanent record of compliance maintained by Woodside and will form the basis for demonstrating that the EPOs and standards are met, which will be summarised in a series of routine reporting documents.

#### 7.7.1.1 Source-based Impacts and Risks

The tools and systems to monitor environmental performance, where relevant, will include:

- Daily reports which include leading indicator compliance.
- Periodic review of waste management and recycling records.
- Use of contractor's risk identification program that requires recording and submitting safety and environment risk observation cards routinely (frequency varies with contractor).
- Collection of evidence of compliance with the controls detailed in the EP relevant to offshore activities by the Woodside Offshore HSE Adviser (other compliance evidence is collected onshore).
- Environmental discharge reports that record volumes of planned and unplanned discharges downhole (in the well), to ocean and atmosphere.
- Monitoring of progress against the Drilling and Completions function scorecard for KPIs.
- Internal auditing and assurance program as described in **Section 7.6.2**.

Throughout this activity, Woodside will continuously identify new source-based risks and impacts through the Monitoring and Auditing systems and tools described above and in **Section 7.6.2**.

#### 7.7.1.2 Management of Knowledge

Review of knowledge relevant to the existing environment is undertaken in order to identify changes relating to the understanding of the environment or legislation that supports the risk and impact assessments for EPs (in-force and in-preparation). Relevant knowledge is defined as:

- Environmental science supporting the description of the existing environment.
- Socio-economic environment and stakeholder information.
- Environmental legislation.

The frequency and documentation of reviews, communication of relevant new knowledge and consideration of management of change are documented in the WMS Environment Plan Guideline.

Any relevant new information on cultural values will be assessed using the EP Management of Change Process (refer to **Section 7.7**).

Under the Oil Spill Scientific Monitoring Program preparedness, an annual review and update to the environmental baseline studies database is completed and documented. Periodic location-focused environmental studies and baseline data gap analyses are completed and documented. Any

subsequent studies scoped and executed as a result of such gap analysis are managed by the Environment Science Team and tracked via the Corporate Environment Baseline Database.

### 7.7.2 Auditing

Environmental performance auditing will be performed to:

- Identify potential new or changes to existing environmental impacts and risk, and methods for reducing those to ALARP.
- Confirm that mitigation measures detailed in this EP are effectively reducing environmental impacts and risk, that mitigation measures proposed are practicable and provide appropriate information to verify compliance.
- Confirm compliance with the Performance Outcomes, Controls and Standards detailed in this EP.

Internal auditing will be performed to cover each key project activity as summarised below.

#### 7.7.2.1 MODU Activities

Internal auditing is performed on a MODU-specific schedule, rather than a schedule to align with each well. This enables continuous review and improvement of environmental performance over the term of the MODU contract. The following internal audits, inspections and reviews will be performed to review the environmental performance of the activities:

- Survey environment rig equipment for a newly contracted MODU (if not previously contracted to Woodside within the last two years) against Woodside's Engineering Standard – Rig Equipment. This standard covers functional and technical requirements for Woodside contracted rigs and their associated equipment. An environment rig equipment survey scope typically includes mud and solids control systems, environmental discharge control (including drainage management), and loss of containment management.
- Complete a minimum of monthly environmental inspection (conducted by offshore Woodside personnel or a delegate) which may include verifying:
  - bunkering/transfers between support vessels and MODU/project vessels
  - environment containment including chemical storage, spill response equipment and housekeeping
  - general MODU environment risks including waste management, drilling fluids oil/water separation, and inspection of subsea and moonpool areas.
- Perform environment audits quarterly during the Petroleum Activities Program, while the MODU is on location (by a Woodside Environment Adviser or delegate), which may include:
  - operational compliance audits relevant to environmental risk of activities which may include compliance with training commitments, discharge requirements, bunkering activities, verification of use of approved chemicals, and satisfactory close out of items from previous audits
  - inspection of selected risk areas/activities (which may include shaker house, drill floor and mud management while commencing riser drilling or reservoir interception) during routine MODU visits throughout the MODU campaign, determined by risk, previous incidents or operation specification requirements.
  - audit findings relevant to continuous improvement of environmental performance will be tracked through the MODU or vessel compliance action register, a contractor register between the MODU operator or vessel contractor and Woodside.

### 7.7.2.2 Subsea Scope Activities

The following internal assurance will be performed for the subsea scope activities:

- Pre-mobilisation inspection/audit report will be conducted by a relevant person (before commencing). The scope of the audits are risk-based and specific to the relevant activity, but will generally focus on aspects relating to ensuring appropriate understanding of environmental commitments and the operational readiness of the activity scope, including appropriate environmental controls in place. All installation vessels associated with the above scopes will be audited by Woodside. Support or transport vessels will be assessed on a risk-based approach, but will be audited via the primary subsea installation contractor's process.
- At least one operational compliance audit relevant to applicable EP commitments will be conducted by a Woodside Environment Adviser for the subsea campaign. The audit may be conducted offshore or office-based, subject to the duration of the activity and logistics of performing the audit offshore for short duration scopes (e.g. pipelay).
- Contractor-specific HSE audits will also be conducted of the associated support vessels. The audits will consider the implementation of HSE management, risk management, as well as pre-mobilisation and offshore readiness.
- Vessel based HSE inspections will be conducted fortnightly by vessel HSE personnel. Each inspection will focus on a specific risk area relevant to the project activity and a formal report will be issued (for example, bunkering controls, chemical and discharge management, cetacean reporting, etc).

The internal audits and reviews, combined with the ongoing monitoring described in **Section 7.6.1**, and collection of evidence for MC are used to assess EPOs and standards.

As part of Woodside's EMS and/or assurances processes, activities may also be periodically selected for environmental audits as per Woodside's internal auditing process. Audit, inspection and review findings relevant to continuous improvement of environmental performance are tracked through the Environmental Commitments and Actions Register.

This Environmental Commitments and Actions Register is used to track subsea support vessel and subsea activity compliance with EP commitments, including any findings and corrective actions.

Non-conformances identified will be reported and/or tracked in accordance with **Section 7.6.3**.

### 7.7.2.3 Marine Assurance

Woodside's marine assurance is managed by the Marine Assurance Team of the Logistics Function in accordance with Woodside's Marine Offshore Vessel Assurance Procedure. The Woodside process is based on industry standards and consideration of guidelines and recommendations from recognised industry organisations such as Oil Companies International Marine Forum and International Maritime Contractors Association.

Woodside's Marine Offshore Assurance process is mandatory for all vessels (other than Tankers and Floating Production Storage and Offloading vessels) that are chartered directly by or on behalf of Woodside, including for short term hires (i.e. <3 months in duration). It defines applicable marine offshore assurance activities, ensuring all vessel operators operate seaworthy vessels that meet the requirements for a defined scope of work and are managed with a robust Safety Management System.

The process is multi-faceted and encompasses the following marine assurance activities:

- Safety Management System Assessment
- Dynamic Positioning (DP) System Verification

- Vessel Inspections
- Project support for tender review, evaluation and pre/post contract award.

Vessel inspections are used to verify actual levels of compliance with the company's Safety Management System, the overall condition of the vessel and the status of the planned maintenance system onboard. Woodside Marine Assurance Specialist will conduct a risk assessment on the vessel to determine the level of assurance applied and the type of vessel inspection required.

Methods of vessel inspection may include, and are not limited to:

- Woodside Marine Vessel Inspection
- OCIMF OVID Inspection
- IMCA CMID Inspection
- Marine Warranty Survey

Upon completion of the marine assurance process, to confirm that identified concerns are addressed appropriately and conditions imposed are managed, the Woodside Marine Assurance Team will issue the vessel a statement of approval. Should a vessel not meet the requirements of the Woodside Marine Offshore Vessel Assurance Process and be rejected, there does exist an opportunity to further scrutinise the proposed vessel.

Where a vessel inspection and/or OVMSA Verification Review is not available and all reasonable efforts based on time and resource availability to complete an vessel inspection and/or OVMSA Verification Review are performed (i.e. short term vessel hire), the Marine Assurance Specialist Offshore may approve the use of an alternate means of inspection, known as a risk assessment.

#### 7.7.2.4 Risk Assessment

Woodside conducts a risk assessment of vessels where either an OVMSA Verification Review and/or vessel inspection cannot be completed. This is not a regular occurrence and is typically used when the requirements of the assurance process are unable to be met or the processes detailed are not applicable to a proposed vessel(s). The Marine Vessel Risk Assessment will be conducted by the Marine Assurance Specialist, where the vessel meets the short term hire prerequisites.

The risk assessment is a semi-quantitative method of determining what further assurance process activity, if any, is required to assure a vessel for a particular task or role. The process compares the level of management control a vessel is subject to against the risk factors associated with the activity or role.

Several factors are assessed as part of a vessel risk assessment, including:

- Management control factors:
  - Company audit score (i.e. management system)
  - vessel HSE incidents
  - vessel Port State Control deficiencies
  - instances of Port State Control vessel detainment
  - years since previous satisfactory vessel inspection
  - age of vessel
  - contractors' prior experience operating for Woodside.

- Activity risk factors:
  - people health and safety risks (a function of the nature of the work and the area of operation)
  - environmental risks (a function of environmental sensitivity, activity type and magnitude of potential environment damage (e.g. largest credible oil spill scenario))
  - value risk (likely time and cost consequence to Woodside if the vessel becomes unusable)
  - reputation risk
  - exposure (i.e. exposure to risk based on duration of project)
  - industrial relations risk.

The acceptability of the vessel or requirement for further vessel inspections or audits is based on the ratio of vessel score to activity risk. If the vessel management control is not deemed to appropriately manage activity risk, a satisfactory company audit and/or vessel inspection may be required before awarding work.

The risk assessment is valid for the period a vessel is on hire and for the defined scope of work.

### 7.7.3 Management of Non-conformance

Woodside classifies non-conformances with EPOs and standards in this EP as environmental incidents. Woodside employees and contractors are required to report all environmental incidents, and these are managed as per Woodside's internal event recording, investigation and learning requirements.

An internal computerised database called First Priority is used to record and report these incidents. Details of the event, immediate action taken to control the situation, investigation outcomes and corrective actions to prevent reoccurrence are all recorded. Corrective actions are monitored using First Priority and closed out in a timely manner.

Woodside uses a consequence matrix for classification of environmental incidents, with the significant categories being A, B and C (as detailed in **Section 2.3**). Detailed investigations are completed for all categories A, B, C and high potential environmental incidents.

### 7.7.4 Review

#### 7.7.4.1 Management Review

Within the Environment Function, senior management regularly monitor and review environmental performance and the effectiveness of managing environmental risks and performance. Within each Function and Business Unit Leadership Team (e.g. Drilling and Completions, Subsea and Developments/Projects), managers review environmental performance regularly, including through quarterly HSE review meetings.

Woodside's Drilling and Completions Environment Team will perform six-monthly reviews of the effectiveness of the implementation strategy and associated tools. This will involve reviewing the:

- Drilling and Completions environment KPIs (leading and lagging).
- Tools and systems to monitor environmental performance (detailed in **Section 7.6.1**)
- Lessons learned about implementation tools and throughout each campaign.

Reviews of oil spill arrangements and testing are performed in accordance with **Section 7.10**.

#### 7.7.4.2 Learning and Knowledge Sharing

Learning and knowledge sharing occurs via a number of different methods including:

- Event investigations.
- Event bulletins.
- After action review conducted at the end of each well, including review of environmental incidents as relevant.
- Ongoing communication with MODU operators.
- Formal and informal industry benchmarking.
- Cross asset learnings.
- Engineering and technical authorities discipline communications and sharing.

#### 7.7.4.3 Review of Impacts, Risks and Controls Across the Life of the EP

In the unlikely case that activities described in this EP do not occur continuously or sequentially, before recommencing activities after a cessation period greater than 12 months, impacts, risks and controls will be reviewed.

The process will identify or review impacts and risks associated with the newly-commencing activity, and will identify or review controls to ensure impacts and risks remain/are reduced to ALARP and acceptable levels. Information learned from previous activities conducted under this EP will be considered. Controls which have previously been excluded on the basis of proportionality will be reconsidered. Any required changes will be managed by the MOC process outlined below (**Section 7.7**).

## 7.8 Management of Change and Revision

### 7.8.1 EP Management of Change

Management of changes are managed in accordance with Woodside's Environmental Approval Requirements Australia Commonwealth Guideline. Management of changes relevant to this EP, concerning the scope of the activity description (**Section 3**) including: review of advances in technology at stages where new equipment may be selected such as vessel contracting; changes in understanding of the environment, DAWE EPBC Act listed threatened and migratory species status, Part 13 statutory instruments (recovery plans, threat abatement plans, conservation advice, wildlife conservation plans) and current requirements for AMPs (**Section 4**); and potential new advice from consultation (**Section 5**), will be managed in accordance with Regulation 17 of the Environment Regulations.

Risk will be assessed in accordance with the environmental risk management methodology (**Section 2.3**) to determine the significance of any potential new environmental impacts or risks not provided for in this EP. Risk assessment outcomes are reviewed in compliance with Regulation 17 of the Environment Regulations.

Minor changes where a review of the activity and the environmental risks and impacts of the activity do not trigger a requirement for a formal revision under Regulation 17 of the Environment Regulations, will be considered a 'minor revision'. Minor administrative changes to this EP, where an assessment of the environmental risks and impacts is not required (e.g. document references, phone numbers, etc.), will also be considered a 'minor revision'. Minor revisions as defined above will be made to this EP using Woodside's document control process. Minor revisions will be tracked in an MOC Register to ensure visibility of cumulative risk changes, as well as enable internal EP

updates/reissuing as required. This document will be made available to NOPSEMA during regulator environment inspections.

### 7.8.2 OPEP Management of Change

Relevant documents from the OPEP will be reviewed in the following circumstances:

- implementation of improved preparedness measures
- a change in the availability of equipment stockpiles
- a change in the availability of personnel that reduces or improves preparedness and the capacity to respond
- the introduction of a new or improved technology that may be considered in a response for this activity
- to incorporate, where relevant, lessons learned from exercises or events
- if national or state response frameworks and Woodside's integration with these frameworks changes.

Where changes are required to the OPEP, based on the outcomes of the reviews described above, they will be assessed against Regulation 17 to determine if EP, including OPEP, resubmission is required (see **Section 7.7.1**). Changes with potential to influence minor or technical changes to the OPEP are tracked in management of change records, project records and incorporated during internal updates of the OPEP or the five-yearly revision.

## 7.9 Record Keeping

Compliance records (outlined in MC in **Section 6**) will be maintained.

Record keeping will be in accordance with Regulation 14(7) that addresses maintaining records of emissions and discharges.

## 7.10 Reporting

To meet the EPOs and standards outlined in this EP, Woodside reports at a number of levels, as outlined in the next sections.

### 7.10.1 Routine Reporting (Internal)

#### 7.10.1.1 Daily Progress Reports and Meetings

Daily reports for drilling activities are prepared and issued to key support personnel and stakeholders, by relevant managers responsible for the well. The report provides performance information about drilling activities, heath, safety and environment, and current and planned work activities.

Meetings between key personnel are used to transfer information, discuss incidents, agree plans for future activities and develop plans and accountabilities for resolving issues.

#### 7.10.1.2 Regular HSE Meetings

Regular dedicated HSE meetings are held with the offshore and Perth-based management and advisers to address targeted HSE incidents and initiatives. Minutes of these meetings are produced and distributed as appropriate.

#### 7.10.1.3 Performance Reporting

Monthly and quarterly performance reports are developed and reviewed by the Function and Business Unit Leadership Teams (e.g. Drilling and Completions). These reports cover a number of subject matters, including:

- HSE incidents (including high potential incidents and those related to this EP) and recent activities.
- Corporate KPI targets, which include environmental metrics.
- Outstanding actions as a result of audits or incident investigations.
- Technical high and low lights.

### 7.10.2 Routine Reporting (External)

#### 7.10.2.1 Start and End Notifications of the Petroleum Activities Program

In accordance with Regulation 29, Woodside will notify NOPSEMA and DMIRS of the commencement of the Petroleum Activities Program at least ten days before the activity commences, and will notify NOPSEMA and DMIRS within ten days of completing the activity.

#### 7.10.2.2 Environmental Performance Review and Reporting

In accordance with applicable environmental legislation for the activity, Woodside is required to report information about environmental performance to the appropriate regulator. Regulatory reporting requirements are summarised in **Table 7-6.**

**Table 7-6: Routine external reporting requirements**

| Report | Recipient | Frequency | Content |
|---|---|---|---|
| Monthly Recordable Incident Reports (**Appendix E**) | NOPSEMA | Monthly, by the 15th of each month. | Details of recordable incidents that have occurred during the Petroleum Activities Program for previous month (if applicable). |
| Environmental Performance Report | NOPSEMA | Annually, with the first report submitted within 12 months of the commencement of the Petroleum Activities Program covered by this EP (as per the requirements of Regulation 14(2)). | Compliance with EPOs, controls and standards outlined in this EP, in accordance with the Environment Regulations. |

#### 7.10.2.3 End of the Environmental Plan

The EP will end when Woodside notifies NOPSEMA that the Petroleum Activities Program has ended and all of the obligations identified in this EP have been completed, and NOPSEMA has accepted the notification, in accordance with Regulation 25A of the Environment Regulations.

### 7.10.3 Incident Reporting (Internal)

The process for reporting environmental incidents is described in **Section 7.10.4** of this EP. It is the responsibility of the Woodside Project Manager to ensure reporting of environmental incidents meets Woodside and regulatory reporting requirements as detailed in the Woodside HSE Event Reporting and Investigation Procedure and this section of this EP.

### 7.10.4 Incident Reporting (External) – Reportable and Recordable

#### 7.10.4.1 Reportable Incidents

***Definition***

A reportable incident is defined under Regulation 4 of the Environment Regulations as:

- 'an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage'.

A reportable incident for the Petroleum Activities Program is:

- an incident that has caused environmental damage with a Consequence Level of Moderate (C) or above (as defined under Woodside's Risk Table [refer to **Section 2.3.2**]).
- an incident that has the potential to cause environmental damage with a Consequence Level of Moderate (C) or above (as defined under Woodside's Risk Table [refer to **Section 2.3.2**]).

The environmental Risk assessment for the Petroleum Activities Program (**Section 6**) has not identified any risks with a potential consequence level of C+ for environment. All incidents with actual or potential environmental consequences will be investigated fully. Where an actual or potential environment consequence of C+ is identified this incident will still be classified as a reportable incident and appropriate notifications completed.

Any such incidents represent potential events which would be reportable incidents. Incident reporting is performed with consideration of NOPSEMA (2014) guidance stating, 'if in doubt, notify NOPSEMA', and assessed on a case-by-case basis to determine if they trigger a reportable incident as defined in this EP and by the Regulations.

***Notification***

NOPSEMA will be notified of all reportable incidents, according to the requirements of Regulations 26, 26A and 26AA of the Environment Regulations. Woodside will:

- Report all reportable incidents to the regulator (orally) ASAP, but within two hours of the incident or of its detection by Woodside.
- Provide a written record of the reported incident to NOPSEMA, the National Offshore Petroleum Titles Administrator (NOPTA) and the Department of the responsible State Minister (DMIRS) ASAP after orally reporting the incident.
- Complete a written report for all reportable incidents using a format consistent with the NOPSEMA Form FM0831 – Reportable Environmental Incident (**Appendix E**) which must be submitted to NOPSEMA ASAP, but within three days of the incident or of its detection by Woodside.
- Provide a copy of the written report to the NOPTA and DMIRS, within seven days of the written report being provided to NOPSEMA.

AMSA will be notified of oil spill incidents ASAP after their occurrence, and DAWE notified if MNES are to be affected by the oil spill incident.

### 7.10.4.2 Recordable Incidents

***Definition***

A recordable incident as defined under Regulation 4 of the Environment Regulations is an incident arising from the activity that 'breaches an environmental performance outcome or environmental performance standard, in the EP that applies to the activity, that is not a reportable incident'.

***Notification***

NOPSEMA will be notified of all recordable incidents, according to the requirements of Regulation 26B(4), no later than 15 days after the end of the calendar month using the NOPSEMA Form – Recordable Environmental Incident Monthly Summary Report (**Appendix E**) detailing:

- All recordable incidents that occurred during the calendar month.
- All material facts and circumstances concerning the recordable incidents that the operator knows or is able, by reasonable search or enquiry, to find out.
- Any action taken to avoid or mitigate any adverse environment impacts of the recordable incidents.
- The corrective action that has been taken, or is proposed to be taken, to prevent similar recordable incidents.
- The action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.

### 7.10.4.3 Other External Incident Reporting Requirements

In addition to the notification and reporting of environmental incidents defined under the Environment Regulations and Woodside requirements, **Table 7-7** describes the incident reporting requirements that also apply in the PAA.

**Table 7-7: External Incident Reporting Requirements**

| Event | Responsibility | Notifiable party | Notification requirements | Contact | Contact detail |
|---|---|---|---|---|---|
| Any marine incidents during Petroleum Activities Program | Vessel Master | AMSA | Incident Alert Form 18 as soon as reasonably practicable*<br>Within 72 hours after becoming aware of the incident, submit Incident Report Form 19 | AMSA | reports@amsa.gov.au |
| Oil pollution incidents in Commonwealth waters | Vessel Master | AMSA Rescue Coordination Centre (RCC) | As per Article 8 and Protocol I of MARPOL within two hours via the national emergency 24-hour notification contacts and a written report within 24 hours of the request by AMSA | AMSA RCC Australia | If the ship is at sea, reports are to be made to:<br>Free call: 1800 641 792<br>Phone: 08 9430 2100 (Fremantle) |
| Oil pollution incidents in Commonwealth waters | Vessel Master | AMSA | Without delay as per *Protection of the Sea Act*, part II, section 11(1), AMSA RCC notified verbally via the national emergency 24-hour notification contact of the hydrocarbon spill; follow up with a written Pollution Report ASAP after verbal notification | RCC Australia | Phone:<br>1800 641 792<br>or<br>+61 2 6230 6811<br>AFTN: YSARYCYX |
| Any oil pollution incident which has the potential to enter a National Park or requires oil spill response activities to be conducted within a National Park | Vessel Master | DAWE | Reported verbally, ASAP | Director of National Parks | Phone:<br>02 6274 2220 |
| Activity causes unintentional death of or injury to fauna species listed as Threatened or Migratory under the EPBC Act | Vessel Master | DAWE | Within seven days of becoming aware | Secretary of the DAWE | Phone:<br>1800 803 772<br>Email:<br>protected.species@environment.gov.au |

The following activities should also be reported to AMSA via RCC Australia by the Vessel Master:

- loss of plastic material
- garbage disposed of in the sea within 12 nm of land (garbage includes food, paper, bottles, etc)
- any loss of hazardous materials.

For oil spill incidents, other agencies and organisations will be notified as appropriate to the nature and scale of the incident as per procedures and contact lists in the Oil Pollution Emergency Arrangements (Australia) and the Scarborough Drilling and Completions Oil Pollution First Strike Plan (**Appendix H**).

Woodside prioritises engagement with those persons who may be directly affected, either by the incident itself or in relation to the regulatory or decision-making capacity with respect to incident response. Should it be identified that additional persons such as, but not limited to, commercial fishers, tourism operators or relevant cultural authorities who may be affected within the EMBA, Woodside would, at the relevant time, engage with these parties as appropriate.

External incident reporting requirements under the *OPGGS (Safety) Regulations*, including under Subregulation 2.42, notices and reports of dangerous occurrences will be reported to NOPSEMA under the approved activity safety cases.

## 7.11 Ongoing Consultation

In accordance with Regulation 14 (9) of the Environment Regulations, the implementation strategy must provide for appropriate consultation with relevant authorities of the Commonwealth, a State or Territory and other relevant interested persons or organisations.

Woodside proposes to undertake the engagements with directly impacted relevant persons and additional persons listed **Table 7-8**. Any relevant new information identified during ongoing consultation will be assessed using the EP Management of Knowledge (refer to **Section 7.7.1.2**) and Management of Change Process (refer to **Section 7.7**).

Woodside hosts community forums at which members are provided updates on Woodside activities on a regular basis (for example community reference group meetings). Representatives are from community and industry and include, Woodside, State Government (for instance relevant Regional Development Commissions), Local Government, Indigenous Groups, Industry representative bodies, Community and industry organisations.

Woodside has developed a Program of Ongoing Engagement with Traditional Custodians (**Appendix J**), directly informed by feedback from Traditional Custodians. It provides a mechanism for ongoing dialogue so that Traditional Custodians can, on an ongoing basis, provide Woodside with feedback on its activities.

Relevant persons, additional persons and those who are interested in the activities, can remain up to date on this activity through subscribing to our website.

**Table 7-8: Ongoing consultation engagements**

| Report/ Information | Recipient | Purpose | Frequency | Content |
|---|---|---|---|---|
| Program of Ongoing Engagement with Traditional Custodians (**Appendix J**) | Relevant cultural authorities | Identification, assessment and consideration of cultural values relevant to the | Ongoing | Assessment of cultural values<br>Any relevant new information on cultural values will be assessed using the EP Management of Knowledge (refer to **Section 7.7.4.2**) and |

| Report/ Information | Recipient | Purpose | Frequency | Content |
|---|---|---|---|---|
| | | Operational Area or EMBA | | Management of Change Process (refer to **Section 7.7**). |
| Notification (email) | AHO | As requested by AMSA during consultation. | No less than 4 weeks prior to commencement. | **PS 4.3** (**Section 6.7.1)**<br>Date of activity start. |
| Updates (email) | | | As required. | Changes to planned activities |
| Notification (email) | AMSA | As requested by AMSA during consultation | At least 24–48 hours before operations commence. | **PS 4.5** (**Section 6.7.1**)<br>Date of activity start. |
| Update (email) | | | Provide updates to the AHO and JRCC should there be changes to the activity. | Changes to planned activities |
| Notification (email) | DoD | As requested by DoD during consultation | Five weeks prior to commencement of activities. | **PS 4.8** (**Section 6.7.1**)<br>Date of activity start. |
| Notification (email) | DMIRS | As required by DMIRS | At least 10 days prior to commencement | Activity start date and end date |
| Notification (email) | AFMA<br>Individual fishery licence holders that have the potential to be directly impacted by planned activities in the Operational Area (no relevant fisheries identified at time of EP submission)<br>Recfishwest<br>WAFIC<br>CFA<br>DPIRD<br>DAFF - Fisheries | Good practice or as requested during consultation | No less than 4 weeks prior to commencement and following completion of activities. | **PS 4.4** (**Section 6.7.1**)<br>Date of activity start and end. |
| Notification (email) | Eni | As requested during consultation | At least 10 days prior to commencement of activities | **PS 4.4** |
| Notification (email) | All Relevant Persons and Additional Persons for the Proposed Activity | Notification of significant change | As appropriate | Notification of significant change<br>Any relevant new information will be assessed using the EP Management of Knowledge (ref to **Section 7.7.4.2**) and Management of Change Process (refer to **Section 7.7**). |

| Report/ Information | Recipient | Purpose | Frequency | Content |
|---|---|---|---|---|
| Emails / Meetings | Persons or organisations who provide feedback to Woodside post EP submission | Identification, assessment and consideration of feedback, claims and / or objections | As appropriate | Assessment of claims and / or objections.<br>Relevant new information will be assessed using the EP Management of Knowledge (ref to **Section 7.7.4.2**) and Management of Change Process (refer to **Section 7.7**). |
| Notification (email) | WA Museum (as requested during EP consultation)<br>Australasian Underwater Cultural Heritage Database<br>Any other stakeholders as required in the Unexpected Finds Procedure (**Section 7.4)** | Report any unexpected finds of potential Underwater Cultural Heritage | If triggered by Unexpected Finds Procedure (**Section 7.4**) | Refer to Unexpected Finds Procedure (**Section 7.4) and C 5.6** |

At the time of EP submission, a number of specific activities as part of ongoing consultation regarding the activity are planned with Traditional Custodian Relevant Persons. These are described in Appendix J– Program of Ongoing Engagement with Traditional Custodians.

If any of these activities result in cultural values or heritage features being newly identified, EPO 28 will be implemented to ensure potential impacts are reduced to Acceptable and ALARP Levels.

## 7.12 Emergency Preparedness and Response

### 7.12.1 Overview

Under Regulation 14(8), the implementation strategy must contain an Oil Pollution Emergency Plan (OPEP) and provide for updating the OPEP. Regulation 14(8AA) outlines the requirements for the OPEP which must include adequate arrangements for responding to and monitoring oil pollution.

A summary of how this EP and supporting documents address the various requirements of Environment Regulations relating to oil pollution response arrangements is shown in **Table 7-9**.

**Table 7-9: Oil pollution and preparedness and response overview**

| Content | Environment Regulations Reference | Document/Section Reference |
|---|---|---|
| Details of (oil pollution response) control measures that will be used to reduce the impacts and risks of the activity to ALARP and an acceptable level | Regulation 13(5), (6), 14(3) | Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**) |

| Content | Environment Regulations Reference | Document/Section Reference |
|---|---|---|
| Describes the OPEP | Regulation 14(8) | EP: Woodside's oil pollution emergency plan has the following components:<br>• Woodside Oil Pollution Emergency Arrangements (Australia)<br>• Oil Pollution First Strike Plan (**Appendix H**)<br>• Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**) |
| Details the arrangements for responding to and monitoring oil pollution (to inform response activities), including control measures | Regulation 14(8AA) | Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**)<br>Oil Pollution First Strike Plan (**Appendix H**) |
| Details the arrangements for updating and testing the oil pollution response arrangements | Regulation 14(8), (8A), (8B), (8C) | EP: **Section 7.12**<br>Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**) |
| Details of provisions for monitoring impacts to the environment from oil pollution and response activities | Regulation 14(8D) | Oil Spill Preparedness and Response Mitigation Assessment **(Appendix D**) |
| Demonstrates that the oil pollution response arrangements are consistent with the national system for oil pollution preparedness and control | Regulation 14(8E) | Oil Pollution Emergency Arrangements (Australia) |

### 7.12.2 Emergency Response Training

Regulation 14(5) requires that the implementation strategy includes measures to ensure that employees and contractors have the appropriate competencies and training. Woodside has conducted a risk-based training needs analysis on positions required for effective oil spill response. Following the mapping of training to Woodside identified competencies, training was then mapped to positions based on their required competencies.

**Table 7-10: Minimum levels of competency for key IMT positions**

| IMT Position | Minimum Competency |
|---|---|
| Corporate Incident Coordinate Centre (CICC) Leader | • Incident and Crisis Leadership Development Program (ICLDP)<br>• Oil Spill Response Skills Enhancement Course (OSREC – internal course)<br>• Participation in L2 oil spill exercise (initial)<br>• Participation in L2 oil spill exercise (refresher) |
| Security & Emergency Manager Duty Manager | • ICLDP<br>• OSREC<br>• IMO2 or equivalent spill response specialist level with an oil spill response organisation (OSRO)<br>• Participation in L2 oil spill exercise (initial)<br>• Participation in L2 oil spill exercise (refresher) |
| Operations, Planning, Logistics, Safety | • OSREC<br>• ICC Fundamentals Course (internal course) |

| IMT Position | Minimum Competency |
|---|---|
| | • Participation in L2 oil spill exercise (initial)<br>• Participation in L2 oil spill exercise (refresher) |
| Environment Coordinator | • ICC Fundamentals<br>• OSREC<br>• IMO2 or equivalent spill response specialist level with an OSRO<br>• Participation in L2 oil spill exercise (initial)<br>• Participation in L2 oil spill exercise (refresh) |
| ***Note on competency/equivalency*** | |
| In 2018 Woodside undertook a review of incident and crisis systems, processes and tools to assess whether these were fit-for purpose and has rolled out a change to the Incident and Crisis Management training and the oil spill response training requirements for both ICC and field-based roles.<br>The revised ICC Fundamentals training Program and Incident and Crisis Leaders Development Program (ICLDP) align with the performance requirements of the *PMAOMIR320 – Manage Incident Response Information* and *PMAOM0R418 - Coordinate Incident Response.*<br>Regarding training specific equivalency:<br>• ICLDP is mapped to *PMAOM0R418* (and which is equivalent to IMOIII when combined with Woodside's OSREC course) and ensures broader incident management principles aligned with Australasian Inter-service Incident Management System (AIIMS).<br>• The revised ICC Fundamentals Course is mapped to *PMAOMIR320* (and which is equivalent to IMOII). The blended learning program offers modules aligned to IMOIII, IMOII, IMOI and AMOSC Core Group Training Oil Spill Response Organisation Specialist Level training.<br>• OSREC involves the completion of two (2) online AMSA Modules (Introduction to National Plan and Incident management; and Introduction to oil spills) as well as elements of IMOI and IMOII tailored to Woodside specific OSR capabilities.<br>Woodside Learning Services (WLS) are responsible for collating and maintaining personnel training records. The HSP Dashboard reflects the competencies required for each oil spill role (IMT/operational). | |

### 7.12.3 Emergency Response Preparation

The CICC, based in Woodside's head office in Perth, is the onshore coordination point for an offshore emergency. The CICC is staffed by a roster of appropriately skilled personnel available on call 24 hours a day. The CICC, under the leadership of the CICC Leader, supports the site-based Incident Management Team by providing additional support in areas such as operations, logistics, planning, people management and public information (corporate affairs). A description of Woodside's Incident Command Structure and arrangements is further detailed in the Woodside Oil Pollution Emergency Arrangements (Australia).

Woodside will have an Emergency Response Plan (ERP) in place relevant to the Petroleum Activities Program. The ERP provides procedural guidance specific to the asset and location of operations to control, coordinate and respond to an emergency or incident. For a drilling activity, the ERP will be a bridging document to the contracted rig's emergency documentation. This document summarises the emergency command, control and communications processes for the integrated operation and management of an emergency. It is developed in collaboration with the contracted rig and ensures roles and responsibilities between the contracted rig and Woodside personnel are identified and understood. The ERPs will contain instructions for vessel emergency, medical emergency, search and rescue, reportable incidents, incident notification, contact information and activation of the contractor's emergency centre and Woodside Communication Centre (WCC).

In the event of an emergency of any type:

- On the MODU the OIM will assume overall onsite command and act as the Incident Controller (IC). All persons aboard the MODU will be required to act under the IC's directions. The MODU/vessels will maintain communications with the onshore Drilling

Superintendent and/or other emergency services in the event of an emergency. Emergency response support can be provided by the contractor's emergency centre or WCC if requested by the IC.

- Vessel Master (depending on the location of the emergency) will assume overall onsite command and act as the IC. All persons will be required to act under the IC's directions. The vessels will maintain communications with the onshore project manager and/or other emergency services in the event of an emergency. Emergency response support can be provided by the contractor's emergency centre or WCC if requested by the IC.
- The MODU and project vessels will have on-board equipment for responding to emergencies including medical equipment, fire-fighting equipment and oil spill response equipment.

### 7.12.4 Oil and Other Hazardous Materials Spill

A significant hydrocarbon spill during the proposed Petroleum Activities Program is unlikely, but should such an event occur, it has the potential to result in a serious safety or environmental incident and cause asset and reputational damage if not managed properly. The Woodside Oil Pollution Emergency Arrangements (Australia) document, supported by the Oil Pollution First Strike Plan (**Appendix H**) which provides tactical response guidance to the activity/area and **Appendix D** this EP, cover spill response for this Petroleum Activities Program.

The Security and Emergency Management Function is responsible for managing Woodside's hydrocarbon spill response equipment and for maintaining oil spill preparedness and response documentation. In the event of a major spill, Woodside will request that AMSA (administrator of the National Plan) provides support to Woodside through advice and access to equipment, people and liaison. The interface and responsibilities, as defined under the National Plan, are described in the Woodside Oil Pollution Emergency Arrangements (Australia). AMSA and Woodside have a Memorandum of Understanding in place to support Woodside in the event of an oil spill.

The Oil Pollution First Strike Plan provides immediate actions required to commence a response (**Appendix H**).

The MODU and project vessels will have SOPEPs in accordance with the requirements of MARPOL 73/78 Annex I. These plans outline responsibilities, specify procedures and identify resources available in the event of a hydrocarbon or chemical spill from vessel activities. The Oil Pollution First Strike Plan is intended to work in conjunction with the SOPEPs, if hydrocarbons are released to the marine environment from a vessel.

Woodside has established EPOs, performance standards and MC to be used for oil spill response during the Petroleum Activities Program, as detailed in **Appendix D**.

### 7.12.5 Emergency and Spills Response

Woodside categorises incidents and emergencies in relation to response requirements as follows:

#### 7.12.5.1 Level 1

Level 1 incidents are those that can be resolved using existing resources, equipment and personnel. A Level 1 incident is contained, controlled and resolved by site/regionally based teams using existing resources and functional support services.

#### 7.12.5.2 Level 2

Level 2 incidents are characterised by a response that requires external operational support to manage the incident. It is triggered if the capabilities of the tactical level response are exceeded. This support is provided to the activity by activating all or part of the responsible CICC.

#### 7.12.5.3 Level 3

A Level 3 incident or crisis is identified as a critical event that seriously threatens the organisation's people, the environment, company assets, reputation, or livelihood. At Woodside, the Crisis Management Team (CMT) manages the strategic impacts in order to respond to and recover from the threat to the company (material impacts, litigation, legal and commercial, reputation etc.). The ICC may also be activated as required to manage the operational incident response.

### 7.12.6 Source Control Response Capability

**Source Control IMT Structure**

The Woodside Incident and Crisis Management Structure is outlined in the Woodside Oil Pollution Emergency Arrangements (Australia). In a Level 3 Incident, the Source Control Functional Support Team (FST) will be formed reporting to the Operations Coordinator. The structure of the Source Control FST is shown in **Table 7-2**.

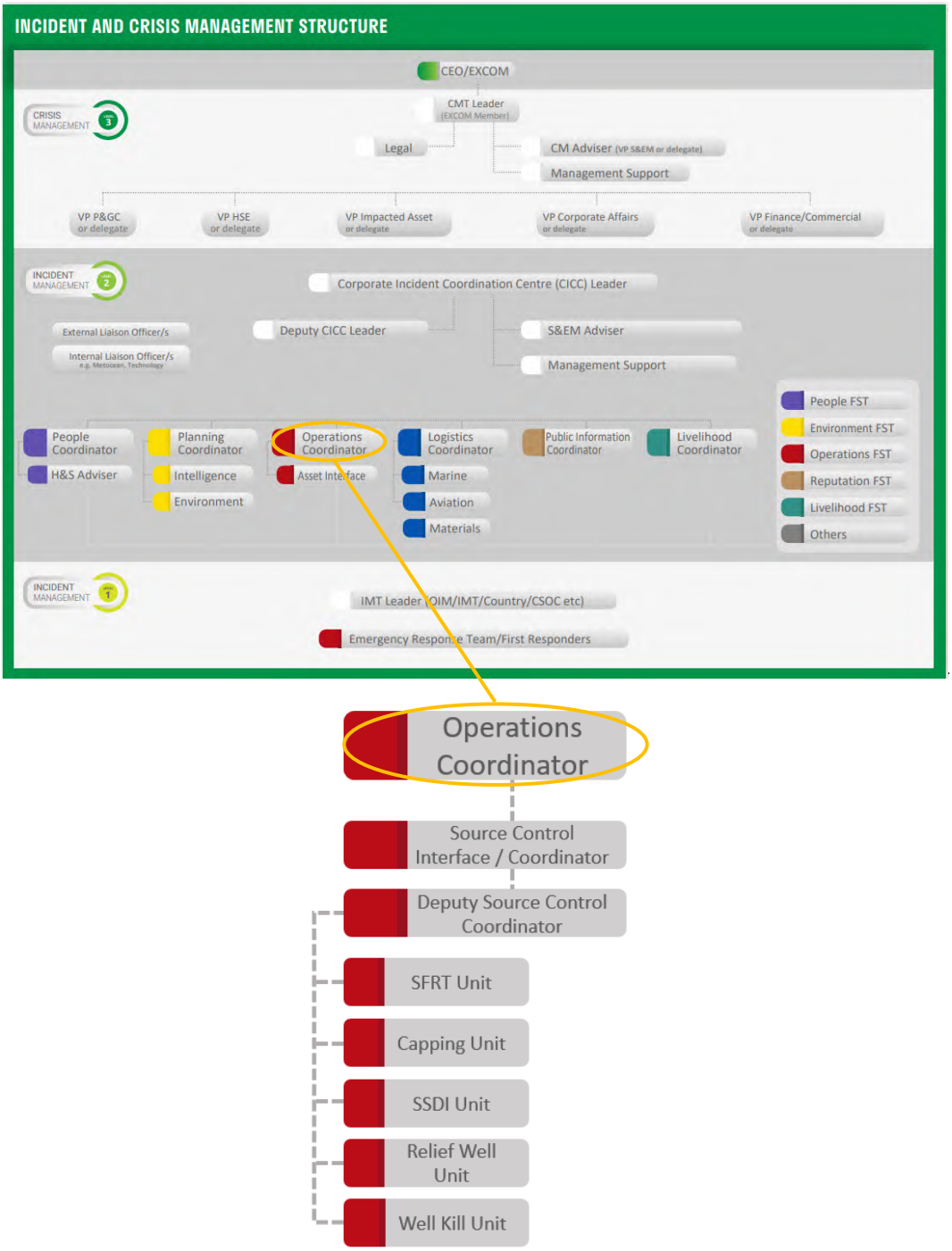


**Figure 7-2: Source Control Functional Support Team Structure**

Roles and responsibilities of the Source Control FST Leaders are summarised in **Table 7-11.**

**Table 7-11: Source Control Functional Support Team roles and responsibilities**

| Role | Key Responsibilities |
|---|---|
| Source Control Coordinator | • Activate Source Control responses<br>• Approve operational plans<br>• Manage Source Control FST |

| Role | Key Responsibilities |
|---|---|
| | • Report to Operations Coordinator |
| Deputy Source Control Coordinator | • Approve operational plans<br>• Manage Source Control Function and ensure coordination among groups/units |
| Subsea First Response Toolkit (SFRT) Unit Coordinator | • Mobilise vessel with work class ROVs<br>• Survey and attempt to function BOP<br>• Debris clearance survey and operations |
| Capping Unit Coordinator | • Mobilise capping stack and support equipment<br>• Assemble and test capping stack for deployment<br>• Hydrate remediation<br>• Capping stack operations as required |
| Subsea Dispersant Injection (SSDI) Unit Coordinator | • Develop dispersant application and monitoring plans<br>• Apply for local Government approvals<br>• Conduct subsea dispersant application and monitoring operations |
| Relief Well Unit Coordinator | • Determine if impacted rig may be utilised for relief rig or capping stack deployment<br>• Determine number of relief wells to be drilled<br>• Obtain and assess information on reservoir and wellbore geometry<br>• Coordinates mobilisation of relief well rig(s) and execution of relief well(s) |
| Well Kill Unit Coordinator | • Obtain and review reservoir and wellbore data<br>• Determine kill weights and pumping rates<br>• Develop the well kill plan<br>• Conduct kill operations |

The Source Control units described in **Table 7-11**, may include the following support positions:

- HSE Adviser/s
- Well Delivery Manager/s
- Subsea Manager/s
- D&C Superintendent/s
- Subsea Vessel Superintendent/s
- Lead D&C and Subsea Engineers
- D&C Engineering support, as required
- Subsea Engineering support, as required
- Contractor Representatives including source control contractors
- Logistics Coordinator/s

#### 7.12.6.1 Source Control Response Personnel Resourcing and Competency

All Source Control unit leader positions will be filled with Woodside personnel from the Subsea and Pipeline (SSPL) and Drilling and Completions (D&C) Departments.

All personnel will hold a relevant tertiary qualification, well control certifications and industry experience commensurate with the position being held.

Initial Source Control functional response will typically be led by a Subsea and Pipeline Manager or Well Delivery Manager in the role of the Source Control Coordinator and the remaining FST roles

would be filled by suitably experienced people, sourced from the operational team and across the broader SSPL and D&C functions.

The Source Control teams will be scaled with additional resources depending on the specifics of the scenario. As the emergency response duration increases suitable arrangements will be made to establish shifts and duty roster cycles to ensure ongoing functional support. Woodside has access to sufficient personnel to cover 24 hour operations on a rolling roster through existing personnel capabilities.

The Source Control IMT response structure indicated in **Figure 7-2** is estimated to require from 4–12 positions per shift varying with the scale of response, 8–24 positions for 24-hour coverage. For an prolonged response resources to provide on/off weekly cycles, an additional 8–24 positions will be required, totalling 16–48 positions over the scale of response. These numbers are indicative and will vary depending on scale and complexity of operations.

The current organisational review indicates Woodside has >80 internal staff members to support the Source Control IMT positions. In the event of a level 3 incident, response activities will be given priority and other projects may be reduced or suspended allowing reallocation of significant additional resources. Woodside would require access to external resources primarily for Specialist Services and Expertise in Source Control / Well Control operations.

Additional personnel to support the Source Control FST will be filled through the following avenues:

- Well Control Specialists through existing contracts e.g. Wild Well Control, Add Energy
- Secondment of Personnel from other Titleholders through APPEA Industry Memorandum of Understanding (2021)
- Engineering support through call-off frame agreements.

Following personnel call-off, online briefings will be held for external personnel prior to commencing work. If building access is required, onboarding will commence as per the Woodside`s Office Access Management Procedures. In the event of an emergency, building access can be expedited at the discretion of the CICC or identified senior leaders and facilities for remote operations would also be set up.

### 7.12.7 Emergency and Spill Response Drills and Exercises

Woodside's capability to respond to incidents will be tested periodically, in accordance with the Emergency and Crisis Management Procedure. The scope, frequency and objective of these tests is described in **Table 7-12**. Emergency response testing is aligned to existing or developing risks associated with Woodside's operations and activities. Corporate hazards/risks outlined in the corporate risk register, respective Safety Cases or project Risk Registers, are reference points developing and scheduling emergency and crisis management exercises. External participants may be invited to attend exercises (e.g. government agencies, specialist service providers, oil spill response organisations, or industry members with which Woodside has mutual aid arrangements).

The overall objective of exercises is to test procedures, skills and the teamwork of the Emergency Response and Command Teams in their ability to respond to major accident / major environment events. After each exercise, the team holds a debriefing session, during which the exercise is reviewed. Any lessons learned or areas for improvement are identified and incorporated into revised procedures, where appropriate.

**Table 7-12: Testing of response capability**

| Response Category | Scope | Response Testing Frequency | Response Testing Objective |
|---|---|---|---|
| ***Level 1 Response*** | Exercises are MODU/ vessel specific | One Level 1 'First Strike' drill conducted within two weeks of commencing activity.<br>[Note: a Level 1 drill must be conducted within two weeks of the campaign commencing and then at least every 6 month hire period thereafter] | Comprehensive exercises test elements of the Oil Pollution First Strike Plan (**Appendix H**).<br>Emergency drills are scheduled to test other aspects of the Emergency Response Plan. |
| ***Level 2 Response*** | Exercises are MODU specific | A minimum of one Emergency Management exercise per MODU per campaign [Note: must be conducted within one month of campaign commencing and at least one Level 2 exercise per 6-month hire period]. | Testing both the facility IMT response and/or that of the CICC following handover of incident control. Exercises may include testing of Source Control Response Strategies. |
| ***Level 3 Response*** | Exercises are relevant to all Woodside assets | The number of CMT exercises conducted each year is determined by the Chief Executive Officer, in consultation with the Vice President of Security and Emergency Management. | Test Woodside's ability to respond to and manage a crisis level incident |

### 7.12.8 Hydrocarbon Spill Response Testing of Arrangements

There are a number of arrangements which, in the event of a spill, will underpin Woodside's ability to implement a response across its petroleum activities. In order to ensure these arrangements are adequately tested, the Capability Development Team within Security and Emergency Management ensures tests are conducted in alignment with the Hydrocarbon Spill Testing of Arrangements Schedule.

Woodside's arrangements for spill response are common across its Australian operating assets and activities to ensure the controls are consistent. The overall objective of testing these arrangements is to ensure that Woodside maintains an ability to respond to a hydrocarbon spill, specifically to:

Ensure relevant responders, contractors and key personnel understand and practise their assigned roles and responsibilities.

Test response arrangements and actions to validate response plans.

Ensure lessons learned are incorporated into Woodside's processes and procedures and improvements are made where required.

If new response arrangements are introduced, or existing arrangements significantly amended, additional testing is undertaken accordingly. Additional activities or activity locations are not anticipated to occur; however, if they do, testing of relevant response arrangements will be undertaken as soon as practicable.

In addition to the testing of response capability described in **Appendix D,** up to eight formal exercises are planned annually, across Woodside, to specifically test arrangements for responding to a hydrocarbon spill to the marine environment.

#### 7.12.8.1 Testing of Arrangements Schedule

Woodside's Testing of Arrangements Schedule aligns with international good practice for spill preparedness and response management; the testing is compatible with the IPIECA Good Practice Guide and the Australian Institute for Disaster Resilience (AIDR) Australian Emergency

Management Arrangements Handbook. If a spill occurs, enacting these arrangements will underpin Woodside's ability to implement a response across its petroleum activities.

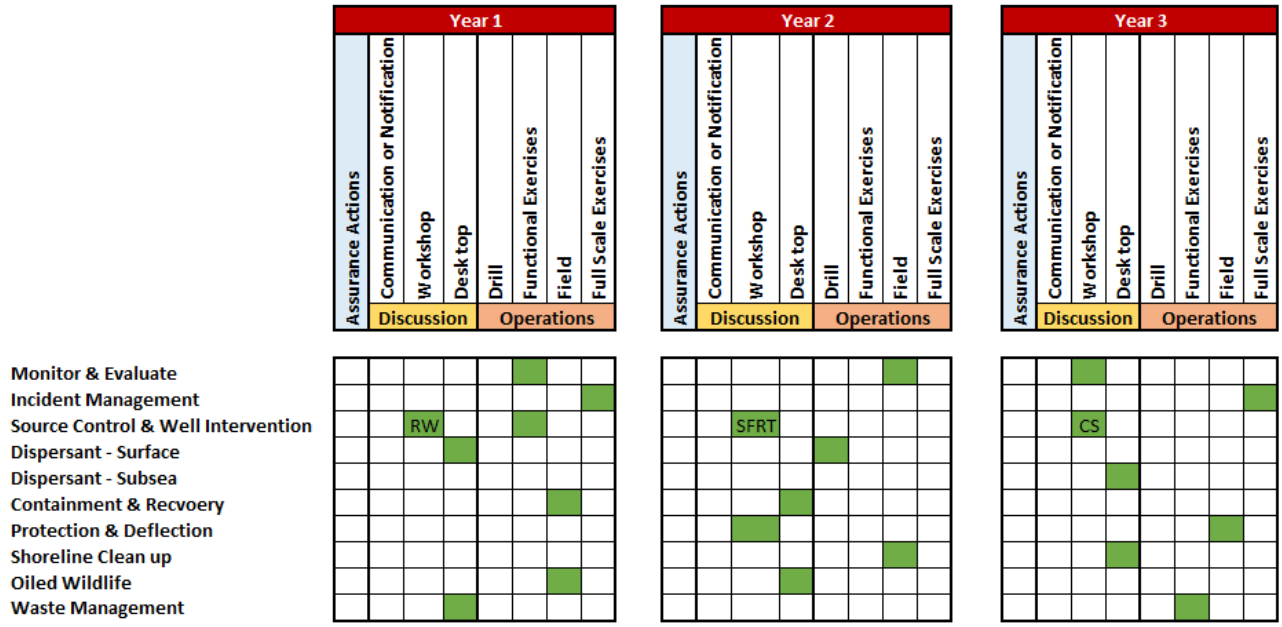


**Figure 7-3: Indicative 3-yearly testing of arrangements schedule**

The hydrocarbon spill arrangements shown in the rows of the schedule are tested against Woodside's regulatory commitments. Each arrangement has a support agency/company and an area to be tested (e.g., capability, equipment and personnel). For example, an arrangement could be to test Woodside's personnel capability for conducting scientific monitoring, or the ability of the Australian Marine Oil Spill Centre to provide response personnel and equipment.

The vertical columns relate to how hydrocarbon spill arrangements will be tested over the 3-year rolling schedule. The sub-heading for the column describes the standard method of testing likely to be undertaken (e.g., discussion exercise, desktop exercise), and the green cells indicate the arrangements that could be tested for each method.

Some arrangements may be tested across multiple exercises (e.g., critical arrangements) or via other 'additional assurance' methods outside the formal Testing of Arrangements Schedule that also constitute sufficient evidence of testing of arrangements (e.g., audits, no-notice drills, internal exercises, assurance drills).

### 7.12.8.2 Source Control testing and exercise arrangements

This section aims to present the testing and exercise arrangements for Source Control techniques as recommended in the recent industry guidelines such as the APPEA Australian Offshore *Titleholders Source Control Guideline* (issued June 2021) and the NOPSEMA Information Paper: *Source Control Planning and Procedures* (issued June 2021)

The paragraphs below elaborate on the scope, testing frequency, objectives and close-out processes applicable to testing/ exercises for Source Control techniques.

***Scope, objectives and KPIs***

- The objective of tests/exercises is to verify the capability of Woodside and/or contractors to manage and deliver elements of the Source Control Plans presented in OPEP.

- Tests may include specific elements of the response cycle for source control strategy, e.g. activation of arrangements, mobilisation of equipment and personnel and if relevant, testing of specific operational plans (e.g. SFRT, capping and relief well).
- Objectives typically include; testing of IMT capabilities, communications requirements, testing of source control response plans and evaluating specific aspects of source control arrangements, e.g. number of personnel, equipment, mobilisation plans and timeframes for response.
- An example of test objectives from recent exercise are presented below for reference –
  - Objective 1 – Exercising Source Control IMT against worst case credible loss of containment scenario
  - Objective 2 – Sourcing of Relief well MODU
  - Objective 3 – Verify key equipment and services availability to support Relief well operations.
  - Objective 4 – Delivery of xx day Relief well as per Activity SCERP.
- KPIs are taken from the ALARP commitments as stated in the OSPRMA (**Appendix D**).
- The exercises are planned utilising SMEs from the function with independent observers/ agencies as available (e.g. AMOSC, OSRL) along with Industry collaboration as available/ permitted.
- Formal exercise plans are produced prior to tests and exercises to document the scope, objectives, allocate resources and select relevant plans and previous lessons learnt for the test or exercise.
- **Table 7-11**: Testing of Response Capability provides indicative scope, testing frequency and objectives of the emergency and spill response drills and exercises which includes Source Control response techniques.

***Frequency of tests***

In addition to Testing of Arrangements for all responses listed in the schedule, source control techniques are tested on an annual basis; at least one technique per year. The schedule for testing of Source Control techniques is described in **Section 7.12.8.1**.

Woodside has tested the below response techniques in last two years:

- SSDI and relief well response in 2019
- SFRT response (joint industry exercise hosted by Woodside) in 2020

Woodside plans to test capping response in Q4 2021. In addition, Woodside Source Control team members participate in joint industry exercises on source control as available for continuous improvements to response plans.

***Close out Processes***

Post-exercise debriefs are held with the exercise team to identify gaps and capture learnings. The recommendations and actions are documented and assigned to the relevant function within the organisation and tracked until close-out. Close-out reports are distributed to relevant function leads and captured under Woodside's document management systems and relevant processes. Lessons learned are incorporated into Woodside's processes and procedures and improvements are made where required.

### 7.12.9 Cyclone and Dangerous Weather Preparation

As the timing of some activities associated with the Petroleum Activities Program are not yet determined, it is possible drilling and subsea activities will overlap with the cyclone season (November to April, with most cyclones occurring between January and March). If drilling in cyclone season, the MODU contractor and vessel contractors must have a Cyclone Contingency Plan (CCP) in place outlining the processes and procedures that would be implemented during a cyclone event, which will be reviewed and accepted by Woodside.

The MODU and project vessels will receive daily forecasts from the Bureau of Meteorology. If a cyclone (or severe weather event) is forecast, the path and its development will be plotted and monitored using the BoM data. If there is the potential for the cyclone (severe weather event) to affect the Petroleum Activities Program, the CCP will be actioned. If required, vessels can transit from the proposed track of the cyclone (severe weather event).

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# 9 GLOSSARY AND ABBREVIATIONS

## 9.1 Glossary

| Term | Meaning |
|---|---|
| (the) Regulator | The Government Agency (State or Commonwealth) that is the decision maker for approvals and performs ongoing regulation of the approval once granted |
| 3D seismic data | A set of numerous closely-spaced seismic lines that provide a high spatially sampled measure of subsurface reflectivity and 3D image |
| Acceptability | The EP must demonstrate that the environmental impacts and risks of an activity will be of an acceptable level as per Regulation 10A(c). |
| ALARP | A legal term in Australian safety legislation, it is taken here to mean that all contributory elements and stakeholdings have been considered by assessment of costs and benefits, and which identifies a preferred course of action |
| API (gravity) | A measure of how heavy or light a petroleum liquid is compared to water |
| Australian Standard | An Australian Standard that provides criteria and guidance on design, materials, fabrication, installation, testing, commissioning, operation, maintenance, re-qualification and abandonment |
| Ballast | Extra weight taken on to increase a ship's stability to prevent rolling and pitching. Most ships use seawater as ballast. Empty tank space is filled with inert (non-combustible) gas to prevent the possibility of fire or explosion. |
| Bathymetry | Related to water depth, a bathymetry map shows the depth of water at a given location on the map. |
| Benthos/Benthic | Relating to the seabed and includes organisms living in or on sediments/rocks on the seabed |
| Biodiversity | Relates to the level of biological diversity of the environment. The EPBC Act defines biodiversity as "the variability among living organisms from all sources (including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part) and includes: (a) diversity within species and between species; and (b) diversity of ecosystems". |
| Biota | The animal and plant life of a particular region, habitat or geological period |
| Cetacean | Whale and dolphin species |
| Consequence | The worst-case credible outcome associated with the selected event, assuming some controls (prevention and mitigation) have failed. Where more than one impact applies (e.g. environmental and legal/compliance), the consequence level for the highest severity impact is selected. |
| Coral | Anthozoa that are characterised by stone-like, horny or leathery skeletons (external or internal). The skeletons of these animals are also called coral. |
| Coral Reef | A wave-resistant structure resulting from skeletal deposition and cementation of hermatypic corals, calcareous algae, and other calcium carbonate-secreting organisms |
| Crustacean | A large and variable group of mostly aquatic invertebrates that have a hard external skeleton (shell), segmented bodies, with a pair of often very modified appendages on each segment, and two pairs of antennae (e.g. crabs, crayfish, shrimps, wood lice, water fleas and barnacles) |
| Cyclone | A rapidly-rotating storm system characterised by a low-pressure centre, strong winds, and a spiral arrangement of thunderstorms that produce heavy rain |
| Datum | A reference location or elevation that is used as a starting point for subsequent measurements |
| dB | Decibel, a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (that is, 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies |

| Term | Meaning |
|---|---|
| dB re 1 µPa$^2$ | Measure of underwater noise, in terms of sound pressure. Because the dB is a relative measure rather than an absolute measure, it must be referenced to a standard 'reference intensity', in this case 1 micro Pascal (1 mPa), which is the standard reference that is used. The dB is also measured over a specified frequency, which is usually either a one Hertz bandwidth (expressed as dB re 1 mPa2/Hz), or over a broadband that has not been filtered. Where a frequency is not specified, it can be assumed that the measurement is a broadband measurement. |
| dB re 1 µPa².s | Normal unit for sound exposure level |
| Demersal | Living close to the floor of the sea (typically of fish) |
| Drill casing | Steel pipe placed in the well as drilling progresses to isolate particular formations or zones, prevent the wall of the well bore formations from caving in, providing pressure integrity as the well is constructed to deeper depths |
| Drilling fluids | The main functions of drilling fluids are to control formation pressures, remove cuttings from the wellbore, seal permeable formations encountered while drilling, cool and lubricate the drill bit, transmit hydraulic energy to downhole tools and the bit and, maintain wellbore stabilit |
| DRIMS | Woodside's internal document management system |
| Dynamic positioning | In reference to a marine vessel that uses satellite navigation and radio transponders in conjunction with thrusters to maintain its position |
| $EC_{50}$ | The concentration of a drug, antibody or toxicant which induces a response halfway between the baseline and maximum after a specified exposure time |
| Echinoderms | Any of numerous radially symmetrical marine invertebrates of the phylum Echinodermata, which includes the starfishes, sea urchins and sea cucumbers, that have an internal calcareous skeleton and are often covered with spines |
| Endemic | A species that is native to or confined to a certain region |
| Environment | The surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelations (Source: ISO 14001) |
| Environment Regulations | OPGGS (Environment) Regulation 2009 |
| Environmental approval | The action of approving something, which has the potential to have an adverse impact on the environment. Environmental impact assessment is generally required before environmental approval is granted. |
| Environmental Hazard | The characteristic of an activity or event that could potentially cause damage, harm or adverse effects on the environment |
| Environmental impact | Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services (Source: HB 203:2006). |
| Environmental impact assessment | An orderly and systematic process for evaluating a proposal or scheme (including its alternatives), and its effects on the environment, and mitigation and management of those effects (Source: Western Australian *Environmental Impact Assessment Administrative Procedures 2010*) |
| EP | Prepared in accordance with the *OPGGS (Environment) Regulations 2009*, which must be assessed and accepted by the Designated Authority (NOPSEMA) before any petroleum-related activity can be performed |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth legislation designed to promote the conservation of biodiversity and protection of the environment. |
| Epifauna | Benthic animals that live on the surface of a substrate |
| Fauna | Collectively, the animal life of a particular region |
| Flora | Collectively, the plant life of a particular region |
| $IC_{50}$ | A measure of the effectiveness of a compound in inhibiting biological or biochemical function |

| Term | Meaning |
|---|---|
| Infauna | Aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom |
| ISO 14001 | ISO 14001 is an international standard that specifies a process (called an EMS) for controlling and improving a company's environmental performance. An EMS provides a framework for managing environmental responsibilities so they become more efficient and more integrated into overall business operations. |
| Jig Fishing | Fishing with a jig, which is a type of fishing lure. A jig consists of a lead sinker with a hook moulded into it and usually covered by a soft body to attract fish. |
| $LC_{50}$ | The concentration of a substance that is lethal to 50% of the population exposed to it for a specified time |
| Likelihood | The description that best fits the chance of the selected consequence actually occurring, assuming reasonable effectiveness of the prevention and mitigation controls |
| MARPOL (73/78) | The International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978.<br>MARPOL 73/78 is one of the most important international marine environmental conventions. It was designed to minimise pollution of the seas, including dumping, oil and exhaust pollution. Its stated objective is to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimisation of accidental discharge of such substances. |
| Meteorology | The study of the physics, chemistry and dynamics of the earth's atmosphere, including the related effects at the air–earth boundary over both land and the oceans |
| Mitigation | Management measures that minimise and manage undesirable consequences |
| NOHSC (1008:2004) | National Occupational Health and Safety Commission – Approved Criteria for Classifying Hazardous Substances |
| Oligotrophic | Low in plant nutrients and having a large amount of dissolved oxygen throughout |
| pH | Measure of the acidity or basicity of an aqueous solution |
| Protected Species | Threatened, vulnerable or endangered species that are protected from extinction by preventive measures. Often governed by special Federal or State laws. |
| Putrescible | Refers to food scraps and other organic waste associated with food preparation that will be subject to decay and rot (putrefaction) |
| Risk | The combination of the consequences of an event and its associated likelihood. For guidance, see Environmental Guidance on Application of Risk Management Procedure. |
| Sessile | Organism that is fixed in one place; immobile |
| Stereo-BRUVS | Stereo-baited remote underwater video systems |
| Syngnathids | Family of fish which includes the seahorses, the pipefishes, and the weedy and leafy sea dragons |
| Teleost | A fish belonging to the Teleostei or Teleostomi, a large group of fishes with bony skeletons, including most common fishes. The teleosts are distinct from the cartilaginous fishes such as sharks, rays, and skates. |
| Thermocline | A temperature gradient in a thermally stratified body of water |
| Zooplankton | Plankton consisting of small animals and the immature stages of larger animals |

## 9.2 Abbreviations

| Abbreviation | Meaning |
|---|---|
| µm | Micrometer |
| ABARES | Australian Bureau of Agricultural and Resource Economics and Sciences |
| ACS | Australian Custom Service |
| AFFF | Aqueous Film Forming Foam |
| AFMA | Australian Fisheries Management Authority |
| AFZ | Australian Fishing Zone |
| AHO | Australian Hydrographic Office |
| AHV | Anchor Handling Vessels |
| AIIMS | Australasian Inter-service Incident Management System |
| AIMS | Australian Institute of Marine Science |
| AIS | Automatic Identification System |
| ALARP | As Low As Reasonably Practicable |
| AMP | Australian Marine Park |
| AMSA | Australian Maritime Safety Authority |
| API | American Petroleum Institute |
| APPEA | Australian Petroleum Production and Exploration Association |
| AS (NZS) | Australian Standard (New Zealand Standard) |
| ASAP | As soon as practicable |
| ASL | Above sea level |
| ATSB | Australian Transport Safety Bureau |
| AusSAR | Australian Search and Rescue |
| bbl | Oil barrel |
| BC | Bioconcentration |
| BCF | Bioconcentration Factor |
| BIA | Biologically Important Area |
| BOD | Biological Oxygen Demand |
| BoM | Bureau of Meteorology |
| BOP | Blow-out Preventer |
| BRUVS | Baited Remote Underwater Video System |
| CALM | Department of Conservation and Land Management |
| CAR | Campaign Action Register |
| CCL | Casing Collar Locator |
| CCP | Cyclone Contingency Plan |
| CEFAS | Centre for Environment, Fisheries and Aquaculture Science |
| CFA | Commonwealth Fisheries Association |
| CH4 | Methane |
| CICC | Corporate Incident Coordination Centre |

| Abbreviation | Meaning |
|---|---|
| CMT | Crisis Management Team |
| CO | Carbon Monoxide |
| CO2 | Carbon Dioxide |
| CoA | Commonwealth of Australia |
| COLREGS | International Regulations for Prevention of Collisions at Sea |
| CS | Cost/Sacrifice |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| Cth | Commonwealth |
| CV | Company Values |
| DAA | Department of Aboriginal Affairs |
| DAWE | Department of Agriculture, Water and the Environment |
| DAWR | Department of Agriculture and Water Resources (now DAWE) |
| dB | Decibel |
| DEC | Department of Environment and Conservation |
| DEWHA | Department of Environment, Water, Heritage and the Arts |
| DGPS | Differential Global Surface Positioning System |
| DIIS | Department of Industry Innovation and Science |
| DMIRS | Department of Mines, Industry Regulation and Safety |
| DMP | Department of Mines and Petroleum |
| DNP | Director of National Parks |
| DoD | Department of Defence |
| DoEE | Department of the Environment and Energy |
| DoF | Department of Fisheries (now part of DMIRS) |
| DoT | Department of Transport |
| DP | Dynamically Positioned |
| DPIRD | Department of Primary Industries and Regional Development |
| DSEWPaC | Department of Sustainability, Environment, Water, Population and Communities |
| $EC_{50}$ | half maximal effective concentration |
| EDS | Emergency Disconnect Sequence |
| EEZ | Exclusive Economic Zone |
| EHU | Electrohydraulic umbilical |
| EMBA | Environment that May Be Affected |
| EMS | Environmental Management System |
| ENVID | Environmental hazard Identification |
| EP | Environment Plan |
| EPO | Environmental Performance Outcome |
| EPS | Environmental Performance Standard |
| ERM | Environmental Resource Management |

| Abbreviation | Meaning |
|---|---|
| ERP | Emergency Response Plans |
| ERT | Emergency Response Team |
| ESD | Ecological Sustainable Development |
| F | Control Feasibility |
| FEWD | Formation Evaluation While Drilling |
| FFFP | Film Forming Fluroprotein Foams |
| FLNG | Floating Liquefied Natural Gas units |
| FPSO | Floating Production, Storage and Offtake vessel |
| FRDC | Fisheries Research and Development Centre |
| FSP | First Strike Plan |
| g/m² | Grams per square metre |
| GDSF | Gascoyne Demersal Scalefish Fishery |
| GHG | Greenhouse Gas |
| GP | Good Practice |
| GR | Gamma Ray |
| GWA | Goodwyn Alpha |
| HDPE | High Density Polyethylene |
| HF | High Frequency |
| HFC | Hydrofluorocarbons |
| HFO | Heavy Fuel Oil |
| HOCNF | Harmonised Offshore Chemical Notification Format |
| HQ | Hazard Quotient |
| HSE | Health, Safety and Environment |
| HSPU | Hydrocarbon Spill Preparedness Unit |
| IAP | Incident Action Plan |
| IAPP | International Air Pollution Prevention |
| IC | Incident Controller |
| $IC_{50}$ | Half maximal inhibitory concentration |
| ICLDP | Incident and Crisis Leadership Development Program |
| IMMR | Inspection, Maintenance, Monitoring, Repair |
| IMO | International Marine Organisation |
| IMS | Invasive Marine Species |
| IOPP | International Oil Pollution Prevention |
| IPIECA | International Petroleum Industry Environmental Conservation Association |
| IS | Implementation Strategy |
| ISPP | International Sewage Pollution Prevention Certificate |
| ITF | Indonesian Through Flow |
| ITOPF | International Tanker Owners Pollution Federation |

| Abbreviation | Meaning |
|---|---|
| IUCN | International Union for Conservation of Nature |
| IUTB | Infield umbilical termination basket |
| JRCC | Joint Rescue Coordination Centre |
| JSA | Job Safety Analysis |
| KBGFC | King Bay Game Fishing Club |
| KEF | Key Ecological Feature |
| kHz | Kilohertz |
| km | Kilometre |
| kPa | Kilopascal |
| KPI | Key Performance Indicator |
| L | Litres |
| LARS | Launch and Recovery Systems |
| LBL | Long Baseline |
| $LC_{50}$ | Lethal concentration, 50% |
| LCS | Legislation, Codes and Standards |
| LF | Low Frequency |
| LNG | Liquefied Natural Gas |
| LOEC | Lowest Observable Effect Concentration |
| LWI | Light Well Intervention |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MC | Measurement Criteria |
| MCDA | Multi Criteria Decision Assessment |
| MDO | Marine Diesel Oil |
| MEG | Mono-ethylene Glycol |
| MF | Mid Frequency |
| MFO | Marine Fauna Observers |
| MIMI | Japan Australia LNG Pty Ltd |
| MMA | Marine Management Area |
| MMSI | Maritime Mobile Service Identity |
| MNES | Matters of National Environmental Significance |
| MOC | Management of Change |
| MODU | Mobile Offshore Drilling Unit |
| MoU | Memorandum of Understanding |
| MP | Marine Park |
| MPA | Marine Protected Areas |
| MPRA | Marine Parks and Reserves Authority |
| $ms^{1}$ | Metres per second |
| MSIN | Maritime Safety Information Notifications |

| Abbreviation | Meaning |
|---|---|
| $N_2O$ | Nitrous Oxide |
| NBSFC | Nickol Bay Sport Fishing Club |
| NCDSF | North Coast Demersal Scalefish Fishery |
| NGERS | National Greenhouse and Energy Reporting |
| NICNA'S | National Industrial Chemicals Notification ad Assessment Scheme |
| NIMS | Non-indigenous Marine Species |
| nm | Nautical mile (1,852 m) a unit of distance on the sea |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NOEC | No Observed Effect Concentration |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority |
| NOPTA | National Offshore Petroleum Titles Administrator |
| NORM | Naturally Occurring Radioactive Material |
| NOx | Oxides of Nitrogen |
| NRC | North Rankin Complex |
| NTM | Notice to Mariners |
| NWBM | Non Water-Based Mud |
| NWMR | North-west Marine Region |
| NWP | Northwest Province |
| NWS | North-west Shelf |
| NWSTF | North West Slope Trawl Fishery |
| OCNS | Offshore Chemical Notification Scheme |
| OEM | Original Equipment Manufacturer |
| OILMAP | Oil Spill Mapping and Analysis Program |
| OIM | Offshore Installation Manager |
| OIW | Oil in Water |
| OOC | Oil on cuttings |
| OPEP | Oil Pollution Emergency Plan |
| OPGGS | Offshore Petroleum and Greenhouse Gas Storage |
| OPP | Offshore Project Proposal |
| OSPAR | Oslo and Paris Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic |
| OSREC | Oil Spill Response Skills Enhancement Course |
| OSRO | Oil Spill Response Organisation |
| OVID | Offshore Vessel Inspection Database |
| OVMSA | Offshore Vessel Safety Management System assessment |
| OWS | Oily Water Separator |
| PAA | Petroleum Activity Area |

| Abbreviation | Meaning |
|---|---|
| PAH | Polyaromatic Hydrocarbon |
| PBA | Pre-emptive Baseline Areas |
| PFC | Perfluorocarbons |
| PIC | Person In Charge |
| PJ | Professional Judgement |
| PLONOR | OSPAR definition of a substance Poses Little Or NO Risk to the environment |
| PM10 | Particulate Matter less than 10 microns |
| PMST | Protected Matters Search Tool |
| PNEC | Predicted No Effect Concentration |
| PPA | Pearl Producers Association |
| ppb | Parts Per Billion |
| ppm | Parts Per Million |
| PS | Performance Standards |
| PSD | Particle Size Distribution |
| psi | Pounds per square inch |
| PSU | Practical Salinity Unit |
| PTS | Permanent Threshold Shift |
| PTW | Permit To Work |
| RBA | Risk Based Analysis |
| RBI | Risk-Based Inspection |
| RCC | Rescue Coordination Centre |
| RMR | Riserless Mud Recovery |
| RMS | Root Mean Square |
| RO | Reverse Osmosis |
| ROV | Remotely Operated Vehicle |
| SA | South Australia |
| S-BRUVS | Stereo-baited Remote Underwater Video System |
| SBTF | Southern Bluefin Tuna Fishery |
| SCE | Solids Control Equipment |
| SCERP | Source Control Emergency Response Plan |
| SEEMP | Ship Energy Efficiency Management Plan |
| SF6 | Sulphur hexafluoride |
| SIMAP | Spill Impact Mapping and Analysis Program |
| SIMOPS | Simultaneous Operations |
| SMPEP | Spill Monitoring Programme Execution Plan |
| SO2 | Sulphur Dioxide |
| SOLAS | Safety of Life at SEA |
| SOPEP | Ship Oil Pollution Emergency Plan |

| Abbreviation | Meaning |
|---|---|
| SPL | Sound Pressure Levels |
| SSIV | Subsea Isolation Valve |
| SV | Societal Values |
| SW | Southwest |
| SWMR | South-west Marine Region |
| TPS | Total Petroleum Hydrocarbons |
| TSS | Total Suspended Solids |
| TTS | Temporary Threshold Shift |
| UK | United Kingdom |
| USBL | Ultra-short baseline |
| USIT | Ultrasonic Imaging Tool |
| VLS | Vertical Lay System |
| VOC | Volatile Organic Hydrocarbons |
| WA | Western Australia |
| WAF | Water Accommodated Fraction |
| WAFIC | Western Australian Fishing Industry Council |
| WBM | Water-Based Mud |
| WCBD | Well Control Bridging Document |
| WCC | Woodside Communication Centre |
| WDTF | Western Deepwater Trawl Fishery |
| WEL | Woodside Energy Ltd |
| WHA | World Heritage Area |
| WLS | Woodside Learning Service |
| WMP | Waste Management Plan |
| WMS | Woodside Management System |
| WOMP | Well Operation Management Plan |
| Woodside | Woodside Energy Ltd |
| XPT | Formation Pressures |

# APPENDIX A. WOODSIDE CORPORATE POLICIES

WOODSIDE POLICY

Woodside Energy

# Environment and Biodiversity Policy

## OBJECTIVE

Woodside recognises the intrinsic value of nature and the importance of conserving biodiversity and ecosystem services to support the sustainable development of our society. We are committed to doing our part. We understand and embrace our responsibility to undertake activities in an environmentally sustainable way.

## PRINCIPLES

Woodside commits to:

- Implementing a systematic approach to the management of the impacts and risks of our operating activities on an ongoing basis, including emissions and air quality, discharge and waste management, water management, biodiversity and protected areas.
- Applying the mitigation hierarchy principle (avoid, minimise, restore) and a continuous improvement approach to ensure we maintain compliance, improve resource use efficiency and reduce our environmental impacts.
- Embedding environmental and biodiversity management, and opportunities, in our business planning and decision making processes.
- Complying with relevant laws and regulations and applying responsible standards where laws do not exist.
- Not undertaking new exploration or development of hydrocarbons within the boundaries of natural sites on the UNESCO World Heritage List (as specified at 1 December 2022). Existing activity may continue if compatible with maintenance of the listed outstanding universal values.
- Not undertaking new exploration or development of hydrocarbons within IUCN Protected Areas (as specified at 1 December 2022) unless compatible with management plans in place for the area. Existing activity may continue if compatible with management plans in place for the area.
- Achieving net zero deforestation1 associated with new projects that take a Final Investment Decision (FID) after 1 December 2022.
- Developing Biodiversity Action Plans for all new major projects (CAPEX >USD$2 billion) that take a FID after 1 December 2022.
- Supporting positive biodiversity outcomes in regions and areas in which we operate.
- Setting targets and publicly reporting on our environmental and biodiversity performance.

## APPLICABILITY

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures.

This Policy will be reviewed regularly and updated as required.

*Approved by the Woodside Energy Group Ltd Board in December 2022.*

[1] Definition of Forest: 'trees higher than 5 meters and a canopy cover of more than 10 percent on the land to be cleared'

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WOODSIDE POLICY

Woodside Energy

# Health and Safety Policy

## OBJECTIVES

At Woodside we believe that process and personal safety related incidents, and occupational illnesses are preventable. We strive to be an industry leader in health and safety and are committed to managing our activities to minimise adverse health and safety risk related impacts.

## PRINCIPLES

Woodside will achieve this by:

- Implementing a systematic approach to health, personal safety, and process safety risk management.
- Maintaining a culture in which everybody is aware of their health and safety obligations and are empowered to speak up and intervene on health and safety issues.
- Identifying current and emerging hazards across the value chain activities to reduce risks to as low as reasonably practicable.
- Embedding health and safety management in our business planning and decision-making processes.
- Integrating health, personal safety and process safety requirements when designing, purchasing, constructing, and modifying equipment and facilities including requiring our contractors to comply with our HSE expectations in a mutually beneficial manner.
- Complying with relevant laws and regulations and applying responsible standards where laws do not exist.
- Setting targets and publicly reporting on our health and safety performance to help us continually improve.

## APPLICABILITY

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside leaders are also responsible for promotion of this Policy in non-operated joint ventures.

This Policy will be reviewed regularly and updated as required.

*Revised by the Woodside Energy Group Ltd Board in December 2022*

WOODSIDE POLICY

Woodside Energy

# Risk Management Policy

## OBJECTIVES

Woodside recognises that risk is inherent in our business and the effective management of risk is vital to deliver our strategic objectives, continued growth and success. We are committed to managing risks in a proactive and effective manner as a source of competitive advantage.

Our approach protects us against potential negative impacts, enables us to take risk for reward and improves our resilience against emerging risks. The objective of our risk management framework is to provide a single consolidated view of risks across the company to understand our full risk exposure and prioritise risk management and governance.

The success of our approach lies in the responsibility placed on everyone at all levels to proactively identify, assess and treat risks relating to the objectives they are accountable for delivering.

## PRINCIPLES

Woodside achieves these objectives by:

- Applying a structured and comprehensive framework for the identification, assessment and treatment of current risks and response to emerging risks;
- Ensuring line of sight of financial and non-financial risks at appropriate levels of the organisation;
- Demonstrating leadership and commitment to integrating risk management into our business activities and governance practices;
- Recognising the value of stakeholder engagement, best available information and proactive identification of potential changes in external and internal context;
- Embedding risk management into our critical business processes and control framework;
- Understanding our exposure to risk and tolerance for uncertainty to inform our decision making and assure that Woodside is operating with due regard to the risk appetite endorsed by the Board; and
- Evaluating and improving the effectiveness and efficiency our approach.

## APPLICABILITY

The Managing Director of Woodside is accountable to the Board of Directors for ensuring this Policy is effectively implemented.

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures.

This Policy will be reviewed regularly and updated as required.

*Reviewed by the Woodside Energy Group Ltd Board in December 2022.*

# APPENDIX B. RELEVANT REQUIREMENTS

The table below refers to Commonwealth Legislation related to the activity

| Commonwealth Legislation | Legislation Summary |
|---|---|
| *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* | The Act seeks "to preserve and protect places, areas and objects of particular significance" to Aboriginal people. Under the Section 9 and 10 provisions of the Act, the Minister for the Environment may declare significant Aboriginal areas temporarily or permanently protected if they are considered under threat. Similar declarations regarding Aboriginal objects can be made under Section 12.<br>Under Section 22 of the Act, the contravention of any of these declarations is an offence. Additionally, the discovery of any Aboriginal remains must be reported to the Minister under Section 20.<br>Damage or interference with Aboriginal objects or places is not an offence under the ATSIHP Act except within Victoria under Section 21U. |
| *Air Navigation Act 1920*<br>• Air Navigation Regulations 1947<br>• Air Navigation (Aerodrome Flight Corridors) Regulations 1994<br>• Air Navigation (Aircraft Engine Emissions) Regulations 1995<br>• Air Navigation (Aircraft Noise) Regulations 1984<br>• Air Navigation (Fuel Spillage) Regulations 1999 | This Act relates to the management of air navigation. |
| *Australian Maritime Safety Authority Act 1990* | This Act establishes a legal framework for the Australian Maritime Safety Authority (AMSA), which represents the Australian Government and international forums in the development, implementation and enforcement of international standards including those governing ship safety and marine environment protection. AMSA is responsible for administering the Marine Orders in Commonwealth waters. |
| *Australian Radiation Protection and Nuclear Safety Act 1998* | This Act relates to the protection of the health and safety of people, and the protection of the environment from the harmful effects of radiation. |
| *Biosecurity Act 2015*<br>• Quarantine Regulations 2000<br>• Biosecurity Regulation 2016<br>• Australian Ballast Water Management Requirements 2017 | This Act provides the Commonwealth with powers to take measures of quarantine, and implement related programs as are necessary, to prevent the introduction of any plant, animal, organism or matter that could contain anything that could threaten Australia's native flora and fauna or natural environment. The Commonwealth's powers include powers of entry, seizure, detention and disposal.<br>This Act includes mandatory controls on the use of seawater as ballast in ships and the declaration of sea vessels voyaging out of and into Commonwealth waters. The Regulations stipulate that all information regarding the voyage of the vessel and the ballast water is declared correctly to the quarantine officers. |

| Commonwealth Legislation | Legislation Summary |
|---|---|
| *Environment Protection and Biodiversity Conservation Act 1999*<br>• Environment Protection and Biodiversity Conservation Regulations 2000 | This Act protects matters of national environmental significance (NES). It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and culturally significant places.<br>Under this Act, actions that may be likely to have a significant impact on matters of NES must be referred to the Commonwealth Environment Minister. |
| *Environment Protection (Sea Dumping) Act 1981*<br>• Environment Protection (Sea Dumping) Regulations 1983 | This Act provides for the protection of the environment by regulating dumping matter into the sea, incineration of waste at sea and placement of artificial reefs. |
| *Industrial Chemicals (Notification and Assessment Act) 1989*<br>• Industrial Chemicals (Notification and Assessment) Regulations 1990 | This Act creates a national register of industrial chemicals. The Act also provides for restrictions on the use of certain chemicals which could have harmful effects on the environment or health. |
| *National Environment Protection Measures (Implementation) Act 1998*<br>• National Environment Protection Measures (Implementation) Regulations 1999 | This Act and Regulations provide for the implementation of National Environment Protection Measures (NEPMs) to protect, restore and enhance the quality of the environment in Australia and ensure that the community has access to relevant and meaningful information about pollution.<br>The National Environment Protection Council has made NEPMs relating to ambient air quality, the movement of controlled waste between states and territories, the national pollutant inventory, and used packaging materials. |
| *National Greenhouse and Energy Reporting Act 2007*<br>• National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 | This Act and associated Rule establishes the legislative framework for the NGER scheme for reporting greenhouse gas emissions and energy consumption and production by corporations in Australia. |
| *Navigation Act 2012*<br>• Marine order 12 – Construction – subdivision and stability, machinery and electrical installations<br>• Marine order 30 - Prevention of collisions<br>• Marine order 47 – Offshore Industry units<br>• Marine order 57 - Helicopter operations<br>• Marine order 91 - Marine pollution prevention—oil<br>• Marine order 93 - Marine pollution prevention—noxious liquid substances<br>• Marine order 94 - Marine pollution prevention—packaged harmful substances<br>• Marine order 96 - Marine pollution prevention—sewage<br>• Marine order 97 - Marine pollution prevention—air pollution | This Act regulates navigation and shipping including Safety of Life at Sea (SOLAS). The Act will apply to some activities of the MODU and project vessels.<br>This Act is the primary legislation that regulates ship and seafarer safety, shipboard aspects of marine environment protection and pollution prevention. |

| Commonwealth Legislation | Legislation Summary |
|---|---|
| *Offshore Petroleum and Greenhouse Gas Storage Act 2006*<br>• Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009<br>• Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011<br>• Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 | This Act is the principal Act governing offshore petroleum exploration and production in Commonwealth waters. Specific environmental, resource management and safety obligations are set out in the Regulations listed. |
| *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*<br>• Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 | This Act provides for measures to protect ozone in the atmosphere by controlling and ultimately reducing the manufacture, import and export of ozone depleting substances (ODS) and synthetic greenhouse gases, and replacing them with suitable alternatives. The Act will only apply to Woodside if it manufactures, imports or exports ozone depleting substances. |
| *Protection of the Sea (Powers of Intervention) Act 1981* | This Act authorises the Commonwealth to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and provides legal immunity for persons acting under an AMSA direction. |
| *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*<br>• Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994<br>• Marine order 91 - Marine pollution prevention—oil<br>• Marine order 93 - Marine pollution prevention—noxious liquid substances<br>• Marine order 94 - Marine pollution prevention—packaged harmful substances<br>• Marine order 95 - Marine pollution prevention—garbage<br>• Marine order 96 - Marine pollution prevention—sewage<br>• Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007<br>• MARPOL Convention | This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. Under this Act, discharge of oil or other harmful substances from ships into the sea is an offence. There is also a requirement to keep records of the ships dealing with such substances.<br>The Act applies to all Australian ships, regardless of their location. It applies to foreign ships operating between 3 nautical miles (nm) off the coast out to the end of the Australian Exclusive Economic Zone (200 nm). It also applies within the 3 nm of the coast where the State/Northern Territory does not have complementary legislation.<br>All the Marine Orders listed, except for Marine Order 95, are enacted under both the *Navigation Act 2012* and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*.<br>This Act is an amendment to the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. This amended Act provides the protection of the sea from pollution by oil and other harmful substances discharged from ships. |
| *Protection of the Sea (Harmful Antifouling Systems) Act 2006*<br>• Marine order 98—(Marine pollution—anti-fouling systems) | This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the application or reapplication of harmful anti-fouling compounds on Australian ships or foreign ships that are in an Australian shipping facility. |
| *Recycling and Waste Reduction (Mandatory Product Stewardship—Mercury-added Products) Rules 2021*<br>(Minamata Convention on Mercury 2017) | This convention is an agreement to protect human and environmental health from the effects of releases of mercury and mercury-containing compounds to the environment. The convention is not yet ratified by Australia, and hence is not currently implemented in Commonwealth law. Australia has signed the convention and is currently undertaking an assessment process prior to ratification. |

| Commonwealth Legislation | Legislation Summary |
|---|---|
| *Underwater Cultural Heritage Act 2018*<br>• Underwater Cultural Heritage Guidance for Offshore Developments<br>• DRAFT Guidelines to Protect Underwater Cultural Heritage | The Act prescribes penalties for damage to protected underwater cultural heritage without a permit under Section 30 or in contravention of a permit under Section 28. Protected underwater cultural heritage is prescribed in Section 16 to automatically include the remains and associated artefacts of any vessel or aircraft that has been in Australian waters for 75 years, whether known or unknown. This protection is also extended to underwater cultural heritage in Commonwealth waters specified by the Environment Minister under Section 17. Without a declaration under this section, Aboriginal underwater cultural heritage is not protected under the UCH Act. |

# APPENDIX C. EPBC ACT PROTECTED MATTERS SEARCH

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 04-Apr-2023

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

# Summary

## Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 1 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 14 |
| Listed Migratory Species: | 26 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Lands: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 17 |
| Whales and Other Cetaceans: | 25 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |
| Habitat Critical to the Survival of Marine Turtles: | None |

## Extra Information

This part of the report provides information that may also be relevant to the area you have

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | None |
| EPBC Act Referrals: | 18 |
| Key Ecological Features (Marine): | 1 |
| Biologically Important Areas: | 1 |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area [ Resource Information ]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

| Feature Name |
|---|
| EEZ and Territorial Sea |

### Listed Threatened Species [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| **BIRD** | | |
| Calidris canutus | | |
| Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Macronectes giganteus | | |
| Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus fulvus | | |
| Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area |
| **FISH** | | |
| Thunnus maccoyii | | |
| Southern Bluefin Tuna [69402] | Conservation Dependent | Breeding known to occur within area |
| **MAMMAL** | | |
| Balaenoptera borealis | | |
| Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera musculus | | |
| Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Balaenoptera physalus | | |
| Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| **REPTILE** | | |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea | | |
| Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata | | |
| Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| **SHARK** | | |
| Carcharodon carcharias | | |
| White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Sphyrna lewini | | |
| Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat may occur within area |

| Listed Migratory Species | | [ Resource Information ] |
|---|---|---|
| Scientific Name | Threatened Category | Presence Text |
| **Migratory Marine Birds** | | |
| Anous stolidus | | |
| Common Noddy [825] | | Species or species habitat may occur within area |
| Fregata ariel | | |
| Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Macronectes giganteus | | |
| Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus | | |
| White-tailed Tropicbird [1014] | | Species or species habitat may occur within area |
| **Migratory Marine Species** | | |
| Balaenoptera bonaerensis | | |
| Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |
| Balaenoptera borealis | | |
| Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera edeni | | |
| Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| Balaenoptera musculus | | |
| Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus | | |
| Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| Carcharhinus longimanus | | |
| Oceanic Whitetip Shark [84108] | | Species or species habitat may occur within area |
| Carcharodon carcharias | | |
| White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat may occur within area |
| Mobula birostris as Manta birostris<br>Giant Manta Ray [90034] | | Species or species habitat may occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Migratory Wetlands Species | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

| Listed Marine Species | | [ Resource Information ] |
|---|---|---|
| Scientific Name | Threatened Category | Presence Text |
| Bird | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area overfly marine area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat may occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Phaethon lepturus | | |
| White-tailed Tropicbird [1014] | | Species or species habitat may occur within area |
| Phaethon lepturus fulvus | | |
| Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area |
| **Reptile** | | |
| Aipysurus laevis | | |
| Olive Seasnake [1120] | | Species or species habitat may occur within area |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea | | |
| Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Disteira kingii | | |
| Spectacled Seasnake [1123] | | Species or species habitat may occur within area |
| Eretmochelys imbricata | | |
| Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Pelamis platurus | | |
| Yellow-bellied Seasnake [1091] | | Species or species habitat may occur within area |

| Whales and Other Cetaceans | | [ Resource Information ] |
|---|---|---|
| Current Scientific Name | Status | Type of Presence |
| Mammal | | |

| Current Scientific Name | Status | Type of Presence |
| --- | --- | --- |
| [Balaenoptera acutorostrata](#)<br>Minke Whale [33] | | Species or species habitat may occur within area |
| [Balaenoptera bonaerensis](#)<br>Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |
| [Balaenoptera borealis](#)<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| [Balaenoptera edeni](#)<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| [Delphinus delphis](#)<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| [Feresa attenuata](#)<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area |
| [Globicephala macrorhynchus](#)<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area |
| [Grampus griseus](#)<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |
| [Kogia breviceps](#)<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area |

| Current Scientific Name | Status | Type of Presence |
| --- | --- | --- |
| Kogia sima as Kogia simus<br>Dwarf Sperm Whale [85043] | | Species or species habitat may occur within area |
| Lagenodelphis hosei<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat may occur within area |
| Mesoplodon densirostris<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area |

| Current Scientific Name | Status | Type of Presence |
|---|---|---|
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area |

## Extra Information

| EPBC Act Referrals | | | [ Resource Information ] |
|---|---|---|---|
| Title of referral | Reference | Referral Outcome | Assessment Status |
| | | | |
| Project Highclere Cable Lay and Operation | 2022/09203 | | Completed |
| Controlled action | | | |
| Equus Gas Fields Development Project, Carnarvon Basin | 2012/6301 | Controlled Action | Completed |
| The Scarborough Project - FLNG & assoc subsea infrastructure, Carnarvon Basin | 2013/6811 | Controlled Action | Post-Approval |
| Not controlled action | | | |
| Bollinger 2D Seismic Survey 200km North of North West Cape WA | 2004/1868 | Not Controlled Action | Completed |
| Hess Exploration Drilling Programme | 2007/3566 | Not Controlled Action | Completed |
| Project Highclere Geophysical Survey | 2021/9023 | Not Controlled Action | Completed |
| Not controlled action (particular manner) | | | |
| 2D marine seismic survey | 2012/6296 | Not Controlled Action (Particular Manner) | Post-Approval |
| Bonaventure 3D seismic survey | 2006/2514 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| CGGVERITAS 2010 2D Seismic Survey | 2010/5714 | Not Controlled Action (Particular Manner) | Post-Approval |
| Deep Water Drilling Program | 2010/5532 | Not Controlled Action (Particular Manner) | Post-Approval |
| Deep Water Northwest Shelf 2D Seismic Survey | 2007/3260 | Not Controlled Action (Particular Manner) | Post-Approval |
| Drilling 35-40 offshore exploration wells in deep water | 2008/4461 | Not Controlled Action (Particular Manner) | Post-Approval |
| Exmouth West 2D Marine Seismic Survey | 2008/4132 | Not Controlled Action (Particular Manner) | Post-Approval |
| Geco Eagle 3D Marine Seismic Survey | 2008/3958 | Not Controlled Action (Particular Manner) | Post-Approval |
| Glencoe 3D Marine Seismic Survey WA-390-P | 2007/3684 | Not Controlled Action (Particular Manner) | Post-Approval |
| Honeycombs MC3D Marine Seismic Survey | 2012/6368 | Not Controlled Action (Particular Manner) | Post-Approval |
| Lion 2D Marine Seismic Survey | 2007/3777 | Not Controlled Action (Particular Manner) | Post-Approval |
| Westralia SPAN Marine Seismic Survey, WA & NT | 2012/6463 | Not Controlled Action (Particular Manner) | Post-Approval |

## Key Ecological Features [ Resource Information ]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

| Name | Region |
|---|---|

| Name | Region |
|---|---|
| Exmouth Plateau | North-west |

## Biologically Important Areas

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Whales | | |
| Balaenoptera musculus brevicauda | | |
| Pygmy Blue Whale [81317] | Distribution | Known to occur |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.



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# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 16-Jan-2023


Summary

Details

- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat

Acknowledgements

# Summary

## Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 2 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 27 |
| Listed Migratory Species: | 43 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Lands: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 68 |
| Whales and Other Cetaceans: | 30 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | 3 |
| Habitat Critical to the Survival of Marine Turtles: | 3 |

## Extra Information

This part of the report provides information that may also be relevant to the area you have

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | None |
| EPBC Act Referrals: | 98 |
| Key Ecological Features (Marine): | 4 |
| Biologically Important Areas: | 9 |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area [ Resource Information ]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

| Feature Name |
| --- |
| EEZ and Territorial Sea |
| Extended Continental Shelf |

### Listed Threatened Species [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| BIRD | | |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Pterodroma mollis<br>Soft-plumaged Petrel [1036] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Sternula nereis nereis<br>Australian Fairy Tern [82950] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| FISH | | |
| Thunnus maccoyii<br>Southern Bluefin Tuna [69402] | Conservation Dependent | Breeding known to occur within area |
| MAMMAL | | |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Eubalaena australis<br>Southern Right Whale [40] | Endangered | Species or species habitat may occur within area |
| REPTILE | | |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area |
| Dermochelys coriacea | | |
| Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Eretmochelys imbricata | | |
| Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Congregation or aggregation known to occur within area |
| SHARK | | |
| Carcharias taurus (west coast population) | | |
| Grey Nurse Shark (west coast population) [68752] | Vulnerable | Species or species habitat may occur within area |
| Carcharodon carcharias | | |
| White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area |
| Pristis clavata | | |
| Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Species or species habitat known to occur within area |
| Pristis pristis | | |
| Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat likely to occur within area |
| Pristis zijsron | | |
| Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus | | |
| Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Sphyrna lewini | | |
| Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat likely to occur within area |

| Listed Migratory Species | | [ Resource Information ] |
|---|---|---|
| Scientific Name | Threatened Category | Presence Text |
| Migratory Marine Birds | | |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Ardenna carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Species or species habitat may occur within area |
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| Migratory Marine Species | | |
| Anoxypristis cuspidata<br>Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat may occur within area |
| Balaenoptera bonaerensis<br>Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Carcharhinus longimanus<br>Oceanic Whitetip Shark [84108] | | Species or species habitat likely to occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area |
| Eubalaena australis as Balaena glacialis australis<br>Southern Right Whale [40] | Endangered | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area |
| Lamna nasus<br>Porbeagle, Mackerel Shark [83288] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area |
| Mobula alfredi as Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray [90033] | | Species or species habitat known to occur within area |
| Mobula birostris as Manta birostris<br>Giant Manta Ray [90034] | | Species or species habitat known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Congregation or aggregation known to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pristis clavata<br>Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Species or species habitat known to occur within area |
| Pristis pristis<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Pristis zijsron | | |
| Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus | | |
| Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations) | | |
| Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat known to occur within area |
| Migratory Wetlands Species | | |
| Actitis hypoleucos | | |
| Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata | | |
| Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus | | |
| Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris ferruginea | | |
| Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos | | |
| Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Numenius madagascariensis | | |
| Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus | | |
| Osprey [952] | | Species or species habitat known to occur within area |

## Other Matters Protected by the EPBC Act

| Listed Marine Species | | [ Resource Information ] |
|---|---|---|
| Scientific Name | Threatened Category | Presence Text |
| Bird | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Ardenna carneipes as Puffinus carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area overfly marine area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area overfly marine area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat known to occur within area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Species or species habitat may occur within area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area |
| Pterodroma mollis<br>Soft-plumaged Petrel [1036] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| Fish | | |
| Acentronura larsonae<br>Helen's Pygmy Pipehorse [66186] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Bulbonaricus brauni<br>Braun's Pughead Pipefish, Pug-headed Pipefish [66189] | | Species or species habitat may occur within area |
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area |
| Choeroichthys latispinosus<br>Muiron Island Pipefish [66196] | | Species or species habitat may occur within area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area |
| Doryrhamphus multiannulatus<br>Many-banded Pipefish [66717] | | Species or species habitat may occur within area |
| Doryrhamphus negrosensis<br>Flagtail Pipefish, Masthead Island Pipefish [66213] | | Species or species habitat may occur within area |
| Festucalex scalaris<br>Ladder Pipefish [66216] | | Species or species habitat may occur within area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area |
| Halicampus nitidus<br>Glittering Pipefish [66224] | | Species or species habitat may occur within area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area |
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area |
| Hippocampus trimaculatus<br>Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area |
| Phoxocampus belcheri<br>Black Rock Pipefish [66719] | | Species or species habitat may occur within area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area |
| Reptile | | |
| Acalyptophis peronii<br>Horned Seasnake [1114] | | Species or species habitat may occur within area |
| Aipysurus duboisii<br>Dubois' Seasnake [1116] | | Species or species habitat may occur within area |
| Aipysurus eydouxii<br>Spine-tailed Seasnake [1117] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Aipysurus laevis<br>Olive Seasnake [1120] | | Species or species habitat may occur within area |
| Astrotia stokesii<br>Stokes' Seasnake [1122] | | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area |
| Chitulia ornata as Hydrophis ornatus<br>Spotted Seasnake, Ornate Reef Seasnake [87377] | | Species or species habitat may occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Disteira kingii<br>Spectacled Seasnake [1123] | | Species or species habitat may occur within area |
| Disteira major<br>Olive-headed Seasnake [1124] | | Species or species habitat may occur within area |
| Emydocephalus annulatus<br>Turtle-headed Seasnake [1125] | | Species or species habitat may occur within area |
| Ephalophis greyi<br>North-western Mangrove Seasnake [1127] | | Species or species habitat may occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Hydrophis elegans<br>Elegant Seasnake [1104] | | Species or species habitat may occur within area |
| Leioselasma czeblukovi as Hydrophis czeblukovi<br>Fine-spined Seasnake, Geometrical Seasnake [87374] | | Species or species habitat may occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Congregation or aggregation known to occur within area |
| Pelamis platurus<br>Yellow-bellied Seasnake [1091] | | Species or species habitat may occur within area |

| Whales and Other Cetaceans | | [ Resource Information ] |
|---|---|---|
| Current Scientific Name | Status | Type of Presence |
| Mammal | | |
| Balaenoptera acutorostrata<br>Minke Whale [33] | | Species or species habitat may occur within area |
| Balaenoptera bonaerensis<br>Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |

| Current Scientific Name | Status | Type of Presence |
| --- | --- | --- |
| [Delphinus delphis](#)<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| [Eubalaena australis](#)<br>Southern Right Whale [40] | Endangered | Species or species habitat may occur within area |
| [Feresa attenuata](#)<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area |
| [Globicephala macrorhynchus](#)<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area |
| [Grampus griseus](#)<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |
| [Indopacetus pacificus](#)<br>Longman's Beaked Whale [72] | | Species or species habitat may occur within area |
| [Kogia breviceps](#)<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area |
| [Kogia sima as Kogia simus](#)<br>Dwarf Sperm Whale [85043] | | Species or species habitat may occur within area |
| [Lagenodelphis hosei](#)<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area |
| [Megaptera novaeangliae](#)<br>Humpback Whale [38] | | Species or species habitat known to occur within area |
| [Mesoplodon densirostris](#)<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area |

| Current Scientific Name | Status | Type of Presence |
| --- | --- | --- |
| Mesoplodon ginkgodens<br>Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564] | | Species or species habitat may occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat may occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat known to occur within area |

| Current Scientific Name | Status | Type of Presence |
|---|---|---|
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area |

| Australian Marine Parks | [ Resource Information ] |
|---|---|
| Park Name | Zone & IUCN Categories |
| Gascoyne | Habitat Protection Zone (IUCN IV) |
| Gascoyne | Multiple Use Zone (IUCN VI) |
| Gascoyne | National Park Zone (IUCN II) |

| Habitat Critical to the Survival of Marine Turtles | | |
|---|---|---|
| Scientific Name | Behaviour | Presence |
| Aug - Sep | | |
| Natator depressus<br>Flatback Turtle [59257] | Nesting | Known to occur |
| Dec - Jan | | |
| Chelonia mydas<br>Green Turtle [1765] | Nesting | Known to occur |
| Nov - May | | |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Nesting | Known to occur |

## Extra Information

| EPBC Act Referrals | | | [ Resource Information ] |
|---|---|---|---|
| Title of referral | Reference | Referral Outcome | Assessment Status |
| | | | |
| Project Highclere Cable Lay and Operation | 2022/09203 | | Completed |
| Controlled action | | | |
| 'Van Gogh' Petroleum Field Development | 2007/3213 | Controlled Action | Post-Approval |
| Construct and operate LNG & domestic gas plant including | 2008/4469 | Controlled Action | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Controlled action | | | |
| onshore and offshore facilities - Wheatston | | | |
| Develop Jansz-Io deepwater gas field in Permit Areas WA-18-R, WA-25-R and WA-26- | 2005/2184 | Controlled Action | Post-Approval |
| Development of Coniston/Novara fields within the Exmouth Sub-basin | 2011/5995 | Controlled Action | Post-Approval |
| Development of Stybarrow petroleum field incl drilling and facility installation | 2004/1469 | Controlled Action | Post-Approval |
| Enfield full field development | 2001/257 | Controlled Action | Post-Approval |
| Equus Gas Fields Development Project, Carnarvon Basin | 2012/6301 | Controlled Action | Completed |
| Gorgon Gas Development | 2003/1294 | Controlled Action | Post-Approval |
| Gorgon Gas Development 4th Train Proposal | 2011/5942 | Controlled Action | Post-Approval |
| Greater Enfield (Vincent) Development | 2005/2110 | Controlled Action | Post-Approval |
| Pyrenees Oil Fields Development | 2005/2034 | Controlled Action | Post-Approval |
| The Scarborough Project - FLNG & assoc subsea infrastructure, Carnarvon Basin | 2013/6811 | Controlled Action | Post-Approval |
| Vincent Appraisal Well | 2000/22 | Controlled Action | Post-Approval |
| Not controlled action | | | |
| 'Van Gogh' Oil Appraisal Drilling Program, Exploration Permit Area WA-155-P(1) | 2006/3148 | Not Controlled Action | Completed |
| Bollinger 2D Seismic Survey 200km North of North West Cape WA | 2004/1868 | Not Controlled Action | Completed |
| Bultaco-2, Laverda-2, Laverda-3 and Montesa-2 Appraisal Wells | 2000/103 | Not Controlled Action | Completed |
| Carnarvon 3D Marine Seismic Survey | 2004/1890 | Not Controlled Action | Completed |
| Cazadores 2D seismic survey | 2004/1720 | Not Controlled Action | Completed |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action | | | |
| Controlled Source Electromagnetic Survey | 2007/3262 | Not Controlled Action | Completed |
| Exploration drilling well WA-155-P(1) | 2003/971 | Not Controlled Action | Completed |
| Exploration Well in Permit Area WA-155-P(1) | 2002/759 | Not Controlled Action | Completed |
| Exploratory drilling in permit area WA-225-P | 2001/490 | Not Controlled Action | Completed |
| HCA05X Macedon Experimental Survey | 2004/1926 | Not Controlled Action | Completed |
| Hess Exploration Drilling Programme | 2007/3566 | Not Controlled Action | Completed |
| Jansz-2 and 3 Appraisal Wells | 2002/754 | Not Controlled Action | Completed |
| Klammer 2D Seismic Survey | 2002/868 | Not Controlled Action | Completed |
| Montesa-1 and Bultaco-1 Exploration Wells | 2000/102 | Not Controlled Action | Completed |
| Project Highclere Geophysical Survey | 2021/9023 | Not Controlled Action | Completed |
| Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline | 2005/2033 | Not Controlled Action | Completed |
| Wanda Offshore Research Project, 80 km north-east of Exmouth, WA | 2018/8293 | Not Controlled Action | Completed |
| Not controlled action (particular manner) | | | |
| 'Kate' 3D marine seismic survey, exploration permits WA-320-P and WA-345-P, 60km | 2005/2037 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D and 3D seismic surveys | 2005/2151 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D marine seismic survey | 2012/6296 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D marine seismic survey | 2008/4281 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| 3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P | 2003/1271 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D marine seismic survey over petroleum title WA-268-P | 2007/3458 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Marine Seismic Surveys - Contos CT-13 & Supertubes CT-13, offshore WA | 2013/6901 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D seismic survey | 2006/2715 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Seismic Survey, WA | 2008/4428 | Not Controlled Action (Particular Manner) | Post-Approval |
| Agrippina 3D Seismic Marine Survey | 2009/5212 | Not Controlled Action (Particular Manner) | Post-Approval |
| Apache Northwest Shelf Van Gogh Field Appraisal Drilling Program | 2007/3495 | Not Controlled Action (Particular Manner) | Post-Approval |
| Aperio 3D Marine Seismic Survey, WA | 2012/6648 | Not Controlled Action (Particular Manner) | Post-Approval |
| Australia to Singapore Fibre Optic Submarine Cable System | 2011/6127 | Not Controlled Action (Particular Manner) | Post-Approval |
| Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA | 2013/7081 | Not Controlled Action (Particular Manner) | Post-Approval |
| Bonaventure 3D seismic survey | 2006/2514 | Not Controlled Action (Particular Manner) | Post-Approval |
| CGGVERITAS 2010 2D Seismic Survey | 2010/5714 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Charon 3D Marine Seismic Survey | 2007/3477 | Not Controlled Action (Particular Manner) | Post-Approval |
| CVG 3D Marine Seismic Survey | 2012/6654 | Not Controlled Action (Particular Manner) | Post-Approval |
| Deep Water Drilling Program | 2010/5532 | Not Controlled Action (Particular Manner) | Post-Approval |
| Deep Water Northwest Shelf 2D Seismic Survey | 2007/3260 | Not Controlled Action (Particular Manner) | Post-Approval |
| Draeck 3D Marine Seismic Survey, WA-205-P | 2006/3067 | Not Controlled Action (Particular Manner) | Post-Approval |
| Drilling 35-40 offshore exploration wells in deep water | 2008/4461 | Not Controlled Action (Particular Manner) | Post-Approval |
| Eendracht Multi-Client 3D Marine Seismic Survey | 2009/4749 | Not Controlled Action (Particular Manner) | Post-Approval |
| Enfield M3 & Vincent 4D Marine Seismic Surveys | 2008/3981 | Not Controlled Action (Particular Manner) | Completed |
| Enfield M3 4D, Vincent 4D & 4D Line Test Marine Seismic Surveys | 2008/4122 | Not Controlled Action (Particular Manner) | Post-Approval |
| Enfield M4 4D Marine Seismic Survey | 2008/4558 | Not Controlled Action (Particular Manner) | Post-Approval |
| Enfield oilfield 3D Seismic Survey | 2006/3132 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| Exmouth West 2D Marine Seismic Survey | 2008/4132 | Not Controlled Action (Particular Manner) | Post-Approval |
| Foxhound 3D Non-Exclusive Marine Seismic Survey | 2009/4703 | Not Controlled Action (Particular Manner) | Post-Approval |
| Geco Eagle 3D Marine Seismic Survey | 2008/3958 | Not Controlled Action (Particular Manner) | Post-Approval |
| Glencoe 3D Marine Seismic Survey WA-390-P | 2007/3684 | Not Controlled Action (Particular Manner) | Post-Approval |
| Guacamole 2D Marine Seismic Survey | 2008/4381 | Not Controlled Action (Particular Manner) | Post-Approval |
| Harmony 3D Marine Seismic Survey | 2012/6699 | Not Controlled Action (Particular Manner) | Post-Approval |
| Honeycombs MC3D Marine Seismic Survey | 2012/6368 | Not Controlled Action (Particular Manner) | Post-Approval |
| Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA | 2013/7003 | Not Controlled Action (Particular Manner) | Post-Approval |
| Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA | 2013/7093 | Not Controlled Action (Particular Manner) | Post-Approval |
| INDIGO Marine Cable Route Survey (INDIGO) | 2017/7996 | Not Controlled Action (Particular Manner) | Post-Approval |
| Klimt 2D Marine Seismic Survey | 2007/3856 | Not Controlled Action (Particular Manner) | Post-Approval |
| Laverda 3D Marine Seismic Survey and Vincent M1 4D Marine Seismic Survey | 2010/5415 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Leopard 2D marine seismic survey | 2005/2290 | Not Controlled Action (Particular Manner) | Post-Approval |
| Lion 2D Marine Seismic Survey | 2007/3777 | Not Controlled Action (Particular Manner) | Post-Approval |
| Marine reconnaissance survey | 2008/4466 | Not Controlled Action (Particular Manner) | Post-Approval |
| Munmorah 2D seismic survey within permits WA-308/9-P | 2003/970 | Not Controlled Action (Particular Manner) | Post-Approval |
| Ocean Bottom Cable Seismic Program, WA-264-P | 2007/3844 | Not Controlled Action (Particular Manner) | Post-Approval |
| Ocean Bottom Cable Seismic Survey | 2005/2017 | Not Controlled Action (Particular Manner) | Post-Approval |
| Orcus 3D Marine Seismic Survey in WA-450-P | 2010/5723 | Not Controlled Action (Particular Manner) | Post-Approval |
| Osprey and Dionysus Marine Seismic Survey | 2011/6215 | Not Controlled Action (Particular Manner) | Post-Approval |
| Palta-1 exploration well in Petroleum Permit Area WA-384-P | 2011/5871 | Not Controlled Action (Particular Manner) | Post-Approval |
| Pyrenees 4D Marine Seismic Monitor Survey, HCA12A | 2012/6579 | Not Controlled Action (Particular Manner) | Post-Approval |
| Pyrenees-Macedon 3D marine seismic survey | 2005/2325 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| Rydal-1 Petroleum Exploration Well, WA | 2012/6522 | Not Controlled Action (Particular Manner) | Post-Approval |
| Salsa 3D Marine Seismic Survey | 2010/5629 | Not Controlled Action (Particular Manner) | Post-Approval |
| Skorpion Marine Seismic Survey WA | 2001/416 | Not Controlled Action (Particular Manner) | Post-Approval |
| Sovereign 3D Marine Seismic Survey | 2011/5861 | Not Controlled Action (Particular Manner) | Post-Approval |
| Stybarrow 4D Marine Seismic Survey | 2011/5810 | Not Controlled Action (Particular Manner) | Post-Approval |
| Stybarrow Baseline 4D marine seismic survey | 2008/4530 | Not Controlled Action (Particular Manner) | Post-Approval |
| Tortilla 2D Seismic Survey, WA | 2011/6110 | Not Controlled Action (Particular Manner) | Post-Approval |
| Triton 3D Marine Seismic Survey, WA-2-R and WA-3-R | 2006/2609 | Not Controlled Action (Particular Manner) | Post-Approval |
| Undertake a three dimensional marine seismic survey | 2010/5679 | Not Controlled Action (Particular Manner) | Post-Approval |
| Vincent M1 and Enfield M5 4D Marine Seismic Survey | 2010/5720 | Not Controlled Action (Particular Manner) | Post-Approval |
| Warramunga Non-Inclusive 3D Seismic Survey | 2008/4553 | Not Controlled Action (Particular Manner) | Post-Approval |
| West Anchor 3D Marine Seismic Survey | 2008/4507 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Westralia SPAN Marine Seismic Survey, WA & NT | 2012/6463 | Not Controlled Action (Particular Manner) | Post-Approval |
| Referral decision | | | |
| Bianchi 3D Marine Seismic Survey, Carnavon Basin, WA | 2013/7078 | Referral Decision | Completed |
| CVG 3D Marine Seismic Survey | 2012/6270 | Referral Decision | Completed |
| Enfield 4D Marine Seismic Surveys, Production Permit WA-28-L | 2005/2370 | Referral Decision | Completed |
| Stybarrow Baseline 4D Marine Seismic Survey (Permit Areas WA-255-P, WA-32-L, WA- | 2008/4165 | Referral Decision | Completed |

## Key Ecological Features [ Resource Information ]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

| Name | Region |
|---|---|
| Ancient coastline at 125 m depth contour | North-west |
| Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula | North-west |
| Continental Slope Demersal Fish Communities | North-west |
| Exmouth Plateau | North-west |

## Biologically Important Areas

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Marine Turtles | | |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Internesting buffer | Known to occur |
| Chelonia mydas | | |
| Green Turtle [1765] | Internesting buffer | Known to occur |
| Natator depressus | | |
| Flatback Turtle [59257] | Internesting buffer | Known to occur |
| Seabirds | | |

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Ardenna pacifica<br>Wedge-tailed Shearwater [84292] | Breeding | Known to occur |
| **Sharks** | | |
| Rhincodon typus<br>Whale Shark [66680] | Foraging | Known to occur |
| **Whales** | | |
| Balaenoptera musculus brevicauda<br>Pygmy Blue Whale [81317] | Distribution | Known to occur |
| Balaenoptera musculus brevicauda<br>Pygmy Blue Whale [81317] | Foraging | Known to occur |
| Balaenoptera musculus brevicauda<br>Pygmy Blue Whale [81317] | Migration | Known to occur |
| Megaptera novaeangliae<br>Humpback Whale [38] | Migration (north and south) | Known to occur |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

# APPENDIX D. OIL SPILL PREPAREDNESS AND RESPONSE STRAETEGY SELECTION AND EVALUATION

# Oil Spill Preparedness and Response Mitigation Assessment for Scarborough Drilling and Completions

Corporate HSE
Hydrocarbon Spill Preparedness

June 2023
Revision 0a

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# EXECUTIVE SUMMARY

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for the Scarborough Drilling and Completions Activity, hereafter known as the Petroleum Activities Program (PAP). This document demonstrates that the risks and impacts from an unplanned hydrocarbon release, and the associated response operations, are controlled to As Low As Reasonably Practicable (ALARP) and Acceptable levels. It achieves this by evaluating response options to address the potential environmental impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the Environment Plan (EP). This document then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness.

A summary of the key facts and references to additional detail within this document are presented below.

**Table 0-1: Summary of the key details for assessment**

| Key details of assessment | Summary | Reference to additional detail |
|---|---|---|
| Worst Case Credible Scenario | **Credible Scenario-01 (CS-01): Instantaneous hydrocarbon release of marine diesel caused by vessel collision.**<br>A short-term (instantaneous) uncontrolled release of 250 $m^3$ of marine diesel from a vessel, representing a fuel tank rupture after a collision. | **Section 2.2** |
| Other Credible Scenario | **Credible Scenario-03 (CS-03): Loss of well control during drilling of development well**<br>Dry gas – no liquid hydrocarbon is expected at atmospheric temperatures. | |
| Hydrocarbon Properties | **Marine diesel**<br>Under constant 5 kn wind conditions approximately 45% of the oil is predicted to evaporate within 24 hours. The majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will then be subject to more gradual decay through biological and photochemical processes.<br>Under variable wind conditions where winds are of a greater strength, more entrainment of oil into the water column is predicted (about 45% after 24 hours). A further 35% is forecast to evaporate, leaving only a small proportion of the oil floating on the water surface (<1%).<br>**Dry gas**<br>The Scarborough reservoir properties are dry gas, primarily methane (approximately 95%) and nitrogen (approximately 4%), with some ethane, $CO_2$ contents and limited heavier hydrocarbon components. No liquid hydrocarbons are expected at atmospheric conditions. Furthermore, worst case discharge rate ('blowout' rate) modelling predicts that the gas plume will not breach the water's surface. | Section 6.7.2 of the EP<br>Appendix A of the First Strike Plan |
| Modelling Results | **Stochastic modelling**<br>A quantitative, stochastic assessment has been undertaken for CS-01 to help assess the environmental risk of a hydrocarbon spill.<br>A total of 200 replicate simulations were completed for the scenarios to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter.<br>The stochastic modelling did not predict the threshold concentrations required to trigger deterministic modelling. Deterministic modelling was therefore not undertaken and stochastic modelling has been used to scale the response.<br>No receptors are predicted to be contacted by floating oil concentrations at the 10 $g/m^2$ threshold.<br>Deterministic modelling was not undertaken for CS-01. | **Section 2.3** |

<table>
<tr><th>Key details of assessment</th><th>Summary</th><th>Reference to additional detail</th></tr>
<tr><td></td><td>No stochastic or deterministic hydrocarbon spill modelling was undertaken for CS-03.</td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>CS-01: Hydrocarbon release caused by vessel collision (instantaneous release of 250 $m^3$ marine diesel)</td><td>CS-03: Loss of well control during drilling of development well<br>Dry gas release – no liquid hydrocarbon.</td></tr>
<tr><td>Minimum time to shoreline contact (above 100 $g/m^2$)</td><td>No contact at threshold</td><td>N/A – dry gas</td></tr>
<tr><td>Largest volume ashore at any single Response Priority Area (RPA) (above 100$g/m^2$)</td><td>No contact at threshold</td><td>N/A – dry gas</td></tr>
<tr><td>Largest total shoreline accumulation (above 100$g/m^2$) all shorelines</td><td>No contact at threshold</td><td>N/A – dry gas</td></tr>
</table>
</td><td></td></tr>
<tr><td>Net Environmental Benefit Assessment</td><td>Techniques identified as potentially having a net environmental benefit (dependent on the actual spill scenario) and carried forward for further assessment are:<ul><li>monitor and evaluate</li><li>source control via vessel SOPEP (Shipboard Oil Pollution Emergency Plan)</li><li>source control via capping stack</li><li>source control via relief well drilling</li><li>oiled wildlife response</li></ul></td><td>Section 4</td></tr>
<tr><td>ALARP evaluation of selected response techniques</td><td>The evaluation of the selected response techniques shows the proposed controls reduced the risk to an ALARP and acceptable level for the risk are presented in Section 2, without the implementation of considered additional, alternative or improved control measures.</td><td>Section 7</td></tr>
</table>

# 1 INTRODUCTION

## 1.1 Overview

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for the Scarborough Drilling and Completions Activity, hereafter known as the Petroleum Activities Program (PAP). This document outlines Woodside's decisions and techniques for responding to a hydrocarbon loss of containment event and the process for determining its level of hydrocarbon spill preparedness.

## 1.2 Purpose

This document, together with the documents listed below, meet the requirements of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS Environment Regulations) relating to hydrocarbon spill response arrangements.

- The Scarborough Drilling and Completions Environment Plan (EP)
- Oil Pollution Emergency Arrangements (OPEA) (Australia)
- The Scarborough Drilling and Completions Oil Pollution Emergency Plan (OPEP) including;
  - First Strike Plan (FSP)
  - Relevant Operations Plans
  - Relevant Tactical Response Plans (TRPs, also see ANNEX E: Tactical Response Plans)
  - Relevant Supporting Plans
  - Data Directory.

The purpose of this document is to demonstrate that the risks and impacts from an unplanned hydrocarbon release and the associated response operations are controlled to As Low as Reasonably Practicable (ALARP) and Acceptable levels.

## 1.3 Scope

This document demonstrates that the risks and impacts from an unplanned hydrocarbon release and dry gas loss of well control (LOWC), and the associated response operations, are controlled to ALARP and Acceptable levels. It achieves this by evaluating response options to address the potential environmental risks and impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the EP. This document then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness. It should be read in conjunction with the documents listed in **Table 1-1**. The location of the Petroleum Activity Program is shown in Figure 3-2 of the EP.

## 1.4 Oil spill response document overview

The documents outlined in **Table 1-1** and **Figure 1-1** are collectively used to manage the preparedness and response for a hydrocarbon release.

The Oil Pollution First Strike Plan (FSP) contains a pre-operational Net Environmental Benefit Analysis (NEBA) summary, outlining the selected response techniques for this PAP. Relevant Operational Plans to be initiated for associated response techniques are identified in the FSP and relevant forms to initiate a response are appended to the FSP.

The process to develop an Incident Action Plan (IAP) begins once the Oil Pollution FSP is underway. The IAP includes inputs from the Monitor and Evaluate operations and the operational NEBA (**Section 4**). Planning, coordination and resource management are initiated by the Incident Management Team

(IMT). In some instances, technical specialists may be utilised to provide expert advice. The planning may also involve liaison officers from supporting government agencies.

During each operational period, field reports are continually reviewed to evaluate the effectiveness of response operations. In addition, the operational NEBA is continually reviewed and updated to ensure the response techniques implemented continue to result in a net environmental benefit (see **Section 4**).

The response will continue as described in **Section 5** until the response termination criteria have been met.

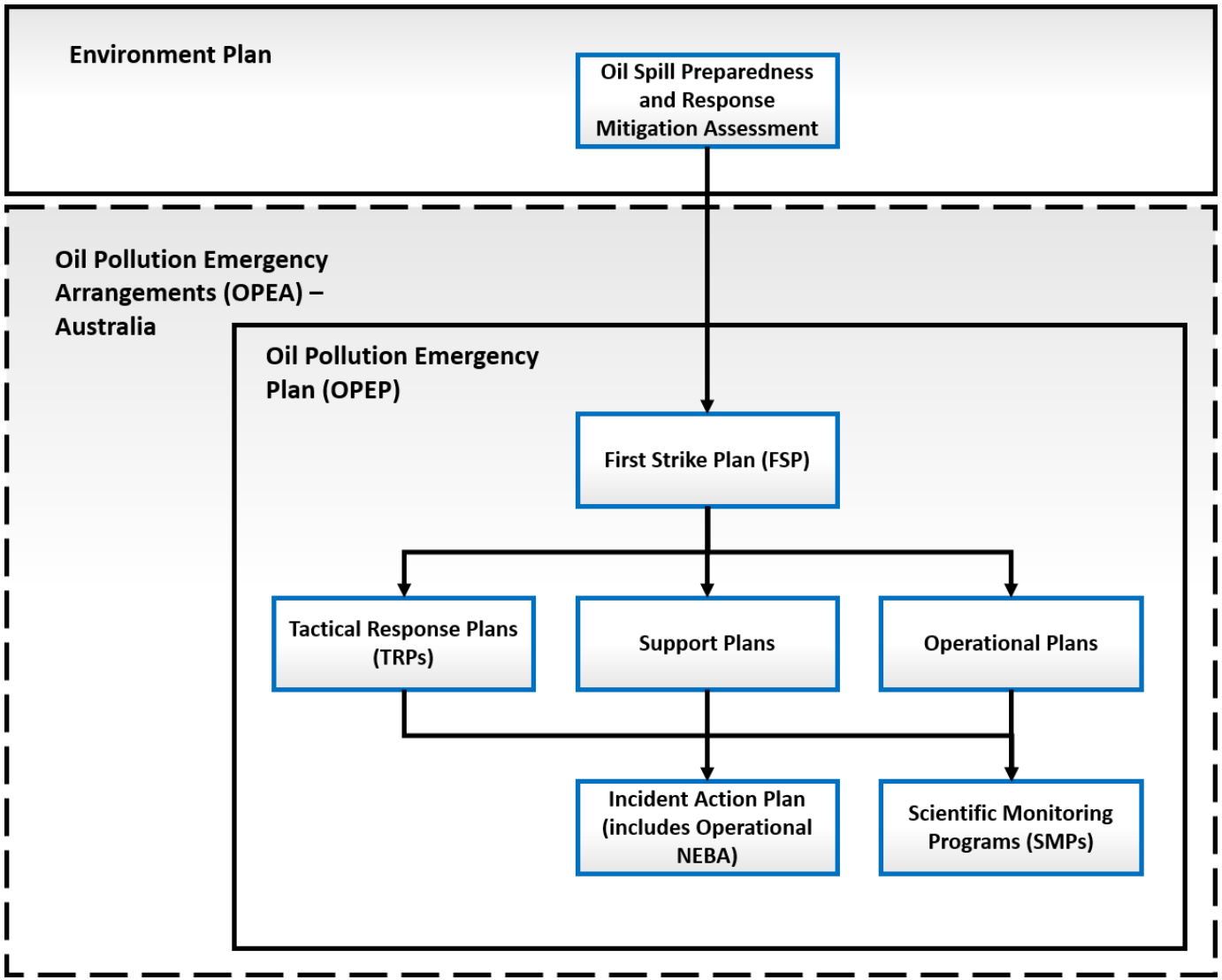


**Figure 1-1: Woodside hydrocarbon spill document structure**

**Table 1-1: Hydrocarbon Spill preparedness and response – document references**

| Document | Document overview | Stakeholders | Relevant information | Document subsections (if applicable) |
|---|---|---|---|---|
| Scarborough Drilling and Completions Environment Plan (EP) | Demonstrates that potential adverse impacts on the environment associated with Scarborough Drilling and Completions activities (during both routine and non-routine operations) are mitigated and managed to ALARP and will be of an acceptable level. | NOPSEMA<br>Woodside internal | EP Section 6 (Identification and evaluation of environmental risks and impacts, including credible spill scenarios)<br>EP Section 6 (Performance outcomes, standards and measurement criteria)<br>EP Section 7 (Implementation strategy – including emergency preparedness and response)<br>EP Section 7 (Reporting and compliance) | |
| Oil Pollution Emergency Arrangements (OPEA) Australia | Describes the arrangements and processes adopted by Woodside when responding to a hydrocarbon spill from a petroleum activity. | Regulatory agencies<br>Woodside internal | All | Link |
| Oil Spill Preparedness and Response Mitigation Assessment for the Scarborough Drilling and Completions (this document) | Evaluates response options to address the potential environmental impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the EP. | Regulatory agencies<br>Corporate Incident Management Team (CIMT): Control function in an ongoing spill response for activity-specific response information. | All<br>Performance outcomes, standards and measurement criteria related to hydrocarbon spill preparedness and response are included in this document. | |

| Document | Document overview | Stakeholders | Relevant information | Document subsections (if applicable) |
|---|---|---|---|---|
| Scarborough Drilling and Completions Oil Pollution First Strike Plan | Facility specific document providing details and tasks required to mobilise a first strike response.<br><br>Primarily applied to the first 24 hours of a response until a full IAP specific to the event is developed.<br><br>Oil Pollution First Strike Plans are intended to be the first document used to provide immediate guidance to the responding IMT. | Site-based IMT for initial response, activation and notification.<br><br>CIMT for initial response, activation and notification.<br><br>CIMT: Control function in an ongoing spill response for activity-specific response information. | Initial notifications and reporting required within the first 24 hours of a spill event.<br><br>Relevant spill response options that could be initiated for mobilisation in the event of a spill.<br><br>Recommended pre-planned tactics.<br><br>Details and forms for use in immediate response. Activation process for oil spill trajectory modelling (OSTM), aerial surveillance and oil spill tracking buoy details. | |
| Operational Plans | Lists the actions required to activate, mobilise and deploy personnel and resources to commence response operations.<br><br>Includes details on access to equipment and personnel (available immediately) and steps to mobilise additional resources depending on the nature and scale of a release.<br><br>Relevant operational plans will be initially selected based on the Oil Pollution First Strike Plan; additional operational plans will be activated depending on the nature and scale of the release. | CIMT: Operations and Logistics functions for first strike activities.<br><br>CIMT: Planning Function to help inform the IAP on resources available. | Locations from where resources may be mobilised.<br><br>How resources will be mobilised.<br><br>Details of where resources may be mobilised to and what facilities are required once the resources arrive.<br><br>Details on how to use resources to undertake a response. | Operational Monitoring Plan<br><br>Source Control Emergency Response Plan<br><br>Oiled Wildlife<br><br>Scientific Monitoring |

| Document | Document overview | Stakeholders | Relevant information | Document subsections (if applicable) |
|---|---|---|---|---|
| Tactical Response Plans | Provides options for response techniques in selected RPAs. Provides site, access and deployment information to support a response at the location. | CIMT: Planning Function to help develop IAPs, and Logistics Function to assist with determining resources required. | Indicative response techniques.<br>Access requirements and/or permissions.<br>Relevant information for undertaking a response at that site.<br>Where applicable, may include equipment deployment locations and site layouts. | For full list of relevant Tactical Plans, refer to **ANNEX E: Tactical Response Plans**. |
| Support Plans | Support Plans detail Woodside's approach to resourcing and the provision of services during a hydrocarbon spill response. | CIMT: Operations, Logistics and Planning functions. | Technique for mobilising and managing additional resources outside of Woodside's immediate preparedness arrangements. | Marine<br>Logistics<br>People & Global Capability Surge Labour Requirement Plan<br>Health & Safety<br>Aviation<br>IT Response Plan<br>Communications Response Plan<br>Stakeholder Engagement<br>Accommodation & Catering<br>Waste Management<br>Guidance for Oil Spill Claims Management<br>Security Support Plan<br>Hydrocarbon Spill Responder Health Monitoring Guideline |

# 2 RESPONSE PLANNING PROCESS

This document details Woodside's process for identifying potential response options for the hydrocarbon release scenarios, identified in the EP. **Figure 2-1** outlines the interaction between Woodside's response, planning/preparedness and selection process.

This structure has been used because it shows how the planning and preparedness activities inform a response and provides indicative guidance on what activities would be undertaken, in sequential order, if a real event were to occur. The process also evaluates alternative, additional and/or improved control measures specific to the PAP.

The Scarborough Drilling and Completions First Strike Plan then summarises the outcome of the response planning process and provides initial response guidance and a summary of ongoing response activities, if an incident were to occur.

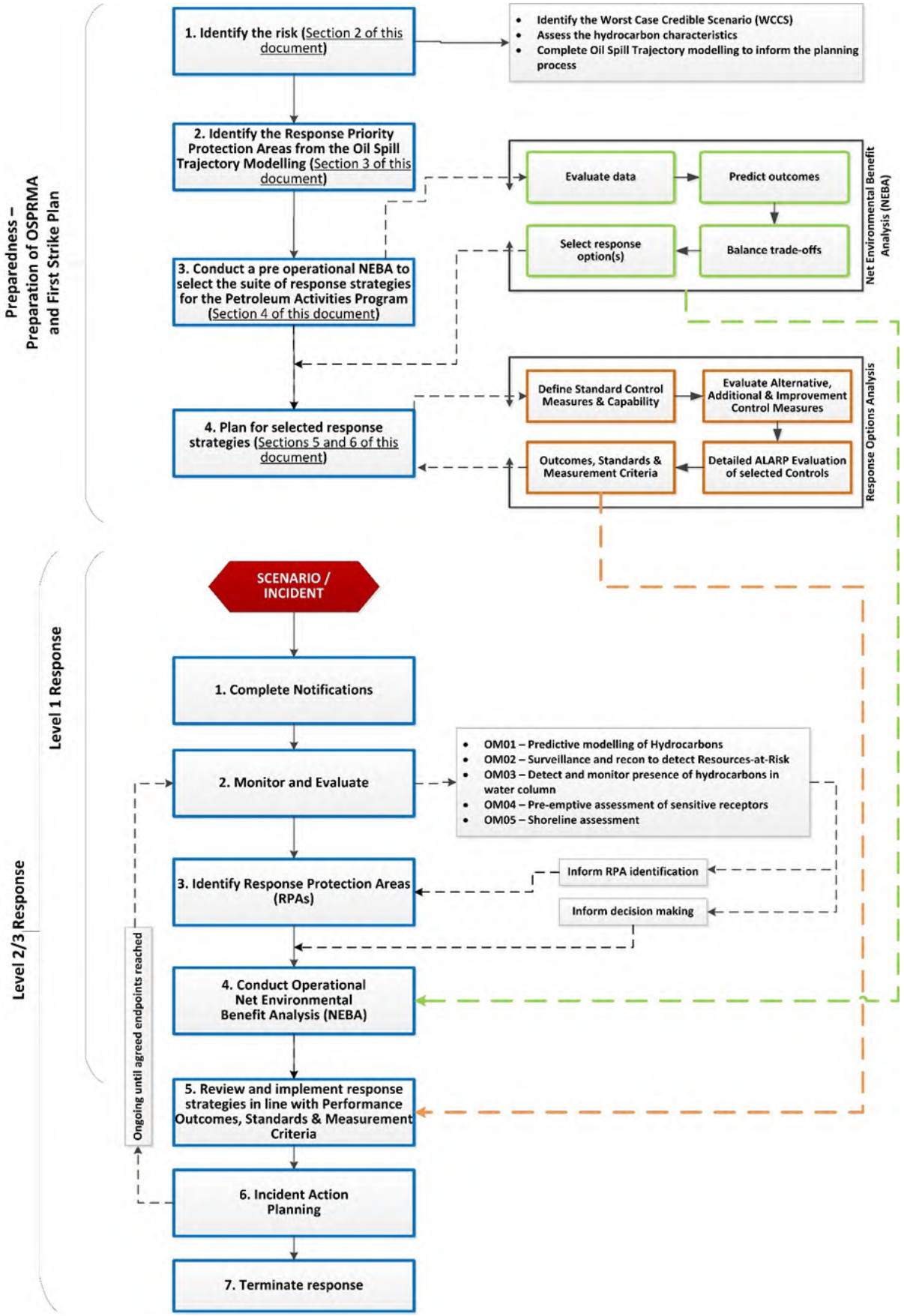


**Figure 2-1: Response planning and selection process**

## 2.1 Response planning process outline

This document is expanded below to provide additional context on the key steps in determining capability, evaluating ALARP and hydrocarbon spill response requirements.

Section 1. INTRODUCTION

Section 2. RESPONSE PLANNING PROCESS

- Identification of worst-case credible scenario(s) (WCCS)
- Spill modelling for WCCS.

Section 3. IDENTIFY RESPONSE PROTECTION AREAS (RPAs)

- Areas predicted to be contacted at concentration >100 g/m$^2$.[1]

Section 4. NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

- Pre-operational NEBA (during planning/ALARP evaluation): this must be reviewed during the initial response to an incident to ensure its accuracy
- Selected response techniques prioritised and carried forward for ALARP assessment.

Section 5. HYDROCARBON SPILL ALARP PROCESS

- Determines the response need based on predicted consequence parameters
- Details the environmental performance of the selected response options based on the need
- Sets the environmental performance outcomes, environmental performance standards and measurement criteria.

Section 6. ALARP EVALUATION

- Evaluates alternative, additional, and improved options for each response technique to demonstrate the risk has been reduced to ALARP
- Provides a detailed ALARP assessment of selected control measure options against:
  - predicted cost associated with implementing the option
  - predicted change to environmental benefit
  - predicted effectiveness / feasibility of the control measure.

Section 7. ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

- Evaluation of impacts and risks from implementing selected response options.

Section 8. ALARP CONCLUSION

Section 9. ACCEPTABILITY CONCLUSION

[1] This represents the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat.

### 2.1.1 Response Planning Assumptions

For the purpose of defining terms related to response planning and timing, the following definitions have been developed:

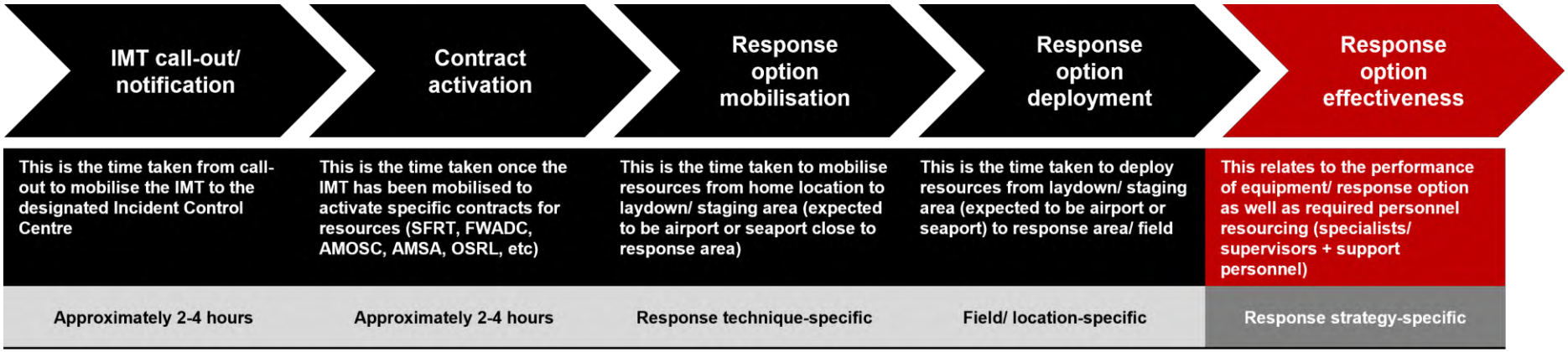


**Figure 2-2: Response Planning Assumptions – Timing, Resourcing and Effectiveness**

## 2.2 Environment plan risk assessment (credible spill scenarios)

Potential hydrocarbon release scenarios from the PAP have been identified during the risk assessment process (Section 6 of the EP). Further descriptions of risk, impacts and mitigation measures (which are not related to hydrocarbon preparedness and response) are provided in Section 6 of the EP. Three unplanned events or credible spill scenarios for the PAP have been selected as representative across types, sources and incident/response levels, up to and including the WCCS.

**Table 2-1** presents the credible scenarios for the PAP. The WCCS for the activity is then used for response planning purposes, as all other scenarios are of a lesser scale and extent. By demonstrating capability to manage the response to the WCCS, Woodside assumes other scenarios that are smaller in nature and scale can also be managed by the same capability. Response performance measures have been defined based on a response to the WCCS.

- CS-01, the surface release of marine diesel caused by vessel collision, is considered the worst case when responding to floating hydrocarbons, given the large volume released instantaneously.
- CS-02, marine fuel loss during bunkering, has a significantly smaller marine diesel release volume and is considered to be within the risk profile and spill response capability requirements of CS-01.
- CS-03, a loss of well control, has also been considered, however, this scenario involves dry gas with no liquid hydrocarbon thus only operational monitoring and source control techniques are applicable.

**Table 2-1: Petroleum Activities Program credible spill scenarios**

| Scenarios | Scenario selected for planning purposes | Scenario description | Maximum credible volume released (liquid $m^3$)[1] | Incident Level | Hydrocarbon (HC) type | Residual proportion | Residual volume (liquid $m^3$) |
|---|---|---|---|---|---|---|---|
| Credible Scenario-01 (CS-01) (Worst Case) | Yes | Hydrocarbon release caused by marine vessel collision. Instantaneous release of 250 $m^3$ of marine diesel within the Operational Area. | Instantaneous release of 250 $m^3$ marine diesel | Level 2 | Marine Diesel | 5% | 12.5 |
| Credible Scenario-02 (CS-02) | No | Marine Fuel Loss during bunkering | Instantaneous release of 8 $m^3$ marine diesel | Level 1 | Marine diesel | 5% | 0.4 $m^3$ |
| Credible Scenario-03 (CS-03) | Yes | Loss of well control during drilling of development well | Dry gas release – no liquid hydrocarbons | Level 3 | Dry gas | N/A | N/A |

### 2.2.1 Hydrocarbon characteristics

***Marine Diesel (~American Petroleum Institute (API) 35) (CS-01)***

Marine Diesel Oil is typically classed as an International Tanker Owners Federation (ITOPF) Group I/II oil.

Marine diesel is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. Under constant 5 kn wind conditions, approximately 45% of the oil is predicted to evaporate within 24 hours. Under these calm conditions the majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will then be subject to more gradual decay through biological and photochemical processes. Under variable wind conditions where winds are of a greater strength, more entrainment of oil into the water column is predicted (about 45% after 24 hours). A further 35% is forecast to evaporate, leaving only a small proportion of the oil floating on the water surface (<1%).

The heavier (low volatility) components of the oil have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind-waves abate. Therefore, the heavier components of this oil can remain entrained or on the sea surface for an extended period, with associated potential for dissolution of the soluble aromatic fraction.

***Dry gas (CS-03)***

The Scarborough reservoir properties are dry gas, primarily methane (approximately 95%) and nitrogen (approximately 4%), with some ethane, $CO_2$ contents and limited heavier hydrocarbon components. No liquid hydrocarbons are expected at atmospheric conditions. Furthermore, worst case discharge rate ('blowout' rate) modelling predicts that the gas plume will not breach the water's surface.

## 2.3 Hydrocarbon spill modelling

Oil spill trajectory modelling tools are used for environmental impact assessment and during response planning to understand spatial scale and timeframes for response operations. Woodside recognises that there is a degree of uncertainty related to the use of modelling data and has subsequently utilised conservative approaches to volumes, weathering, spatial areas, timing and response effectiveness to scale capability to need.

The Oil Spill Model and Response System (OILMAP) and Integrated Oil Spill Impact Model System (Spill Impact Mapping and Analysis Program, SIMAP) models are both used for stochastic and deterministic trajectory modelling. They have been developed over three decades of planning, exercises, actual responses, several peer reviews, and validation studies. OILMAP was originally derived from the United States Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Type A model (French et al. 1996), for assessing marine transport, biological impact and economic impact that was also used under the United States Oil Pollution Act 1990 Natural Resource Damage Assessment (NRDA) regulations. Notable spills where the model has been used and validated against actual field observations include, Exxon Valdez (French McCay 2004), North Cape Oil Spill (French McCay 2003), along with an assessment of 20 other spills (French McCay and Rowe, 2004). In addition, test spills designed to verify fate, weathering and movement algorithms have been conducted regularly and in a range of climate conditions (French and Rines 1997; French et al. 1997; Payne et al. 2007; French McCay et al. 2007).

Further to this, the algorithms have been updated using the latest findings from the Macondo/Deepwater Horizon well blowout in the Gulf of Mexico and validated according to the Deepwater Horizon (DWH) oil spill in support of the Natural Resource Damage Assessment (NRDA) (Spaulding et al. 2015; French McCay et al. 2015, 2016). Finally, the OILMAP and SIMAP models have been used extensively in Australia to prosecute pollution offences, predict discharge locations and likely spill volumes based on weathering and surveillance observations, and has been used as

expert witness evidence in Australian court proceedings, aiding the prosecution to determine spill quantum estimates.

### 2.3.1 Stochastic modelling

Stochastic modelling has been completed for CS-01 outlined in **Table 2-1**, to help assess the environmental consequences of a hydrocarbon spill. A total of 200 replicate simulations were completed for the scenario to test for trends and variations in the trajectory and weathering of the spilled oil over an annual period, with an even number of replicates completed using samples of metocean data that commenced within each month. Further details relating to the assessments for the scenario can be found in Section 6 of the EP.

No stochastic modelling was carried out for a dry gas spill from CS-03, as no liquid hydrocarbon are expected to be released at atmospheric temperatures.

#### 2.3.1.1 Environmental impact thresholds – EMBA and hydrocarbon exposure

The outputs of the stochastic spill modelling are used to assess the potential environmental impact from the credible scenarios. The stochastic modelling results are used to delineate areas of the marine and shoreline environment that could be exposed to hydrocarbon levels exceeding environmental impact threshold concentrations. The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as Environment that May Be Affected (EMBA) and is discussed further in Section 6 of the EP. As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, a different EMBA is presented for each fate within the EP.

A conservative approach – adopting accepted contact thresholds for impacts on the marine environment – is used to define the EMBA. These hydrocarbon thresholds are presented in **Table 2-2** below and described in Section 6 of the EP.

**Table 2-2: Summary of thresholds applied to the stochastic hydrocarbon spill modelling to determine environment that maybe affected and environmental impacts**

| Threshold | Description |
|---|---|
| 10 g / $m^2$ | Surface hydrocarbon |
| 100 ppb | Entrained hydrocarbon (ppb) |
| 50 ppb | Dissolved aromatic hydrocarbon (ppb) |
| 100 g / $m^2$ | Shoreline accumulation |

### 2.3.2 Deterministic Modelling

Deterministic modelling is undertaken where initial stochastic modelling has indicated that floating oil is present at an impact threshold of 50 g/$m^2$ and/or where there is shoreline accumulations at an impact threshold of 100 g/$m^2$. The deterministic modelling outputs are then used to scale the required capability for the offshore (containment and recovery and dispersant) and/or shoreline responses.

The stochastic modelling used as a representative of this PAP did not predict the threshold concentrations required to trigger the undertaking of deterministic modelling. Deterministic modelling was therefore not undertaken and stochastic modelling has been used to scale the response.

### 2.3.3 Response Planning Thresholds for Surface and Shoreline Hydrocarbon Exposure

Thresholds to determine the EMBA are used to predict and assess environmental impacts and inform the scientific monitoring program (SMP), however they do not appropriately represent the thresholds at which an effective response can be implemented. Additional response thresholds are used for response planning and to determine areas where response techniques would be most effective. The spill modelling results are then used to assess the nature and scale of a response.

In the event of an actual response, existing modelling would be reviewed for suitability and additional modelling would be conducted using real-time data and field information to inform Incident Management Team decisions.

The spill modelling outputs are presented at response planning thresholds for surface hydrocarbons for the WCCS. Surface spill concentrations are expressed as grams per square metre ($g/m^2$). The thresholds used are derived from oil spill response planning literature and industry guidance and are summarised below.

### 2.3.3.1 Surface hydrocarbon concentrations

**Table 2-3: Surface hydrocarbon thresholds for response planning**

| Surface hydrocarbon concentration ($g/m^2$) | Description | Bonn Agreement Oil Appearance Code (BAOAC) | Mass per area ($g/m^2$) |
|---|---|---|---|
| >10 | Predicted minimum threshold for commencing operational monitoring | Code 3 – Dull metallic colours | 5 to 50 |
| 50 | Predicted minimum floating oil threshold for containment and recovery and surface dispersant application [2] | Code 4 – Discontinuous true oil colour | 50 to 200 |
| 100 | Predicted optimum floating oil threshold for containment and recovery and surface dispersant application | Code 5 – Continuous true oil colour | >200 |
| **Shoreline hydrocarbon concentration ($g/m^2$)** | **Description** | **National Plan Guidance on Oil Contaminated Foreshores** | **Mass per area ($g/m^2$)** |
| 100 | Predicted minimum shoreline accumulation threshold for shoreline assessment operations | Stain | >100 |
| 250 | Predicted minimum threshold for commencing shoreline clean-up operations | Level 3 - Thin Coating | 200 - 1000 |

The surface thickness of oil at which dispersants are typically effective is approximately 100 $g/m^2$. However, substantial variations occur in the thickness of the oil within the slick, and most fresh crude oils spread within a few hours, so that overall the average thickness is 0.1 mm (or approx. 100 $g/m^2$) (International Tanker Owners Pollution Federation [ITOPF] 2011). Additionally, the recommended rate of application for surface dispersant is typically 1-part dispersant to 20 or 25 parts of spilled oil. These figures assume a 0.1 mm slick thickness, averaged over the thickest part of the spill, to calculate a litres/hectare application rate from vessels and aircraft. In practice, this can be difficult to achieve as it is not possible to accurately assess the thickness of the floating oil.

Some degree of localised over-dosage and under-dosage is inevitable in dispersant response. An average oil layer thickness of 0.1 mm is often assumed, although the actual thickness can vary over a wide range (from less than 0.0001 mm to more than 1 mm) over short distances (International Petroleum Industry Environment Conservation Association [IPIECA] 2015).

Guidance from Australian Maritime Safety Authority (AMSA, 2015) indicates that spreading of spills of Group II or III products will rapidly decrease slick thickness over the first 24 hours of a spill resulting in the potential requirement of up to a ten (10) fold increase in capability on day 2 to achieve the same level of performance.

[2] At $50g/m^2$, containment and recovery and surface dispersant application operations are not expected to be particularly effective. This threshold represents a conservative approach to planning response capability and containing the spread of surface oil.

Further guidance from the European Maritime Safety Authority (EMSA) states that spraying the 'metallic' looking area of an oil slick (Bonn Agreement Oil Appearance Code [BAOAC] 3, approx. 5 – 50 µm) with dispersant from spraying gear designed to treat an oil layer 0.1 mm (100 µm) thick, will inevitably cause dispersant over-treatment by a factor of 2 to 20 times (EMSA 2012).

Therefore, dispersant application should be concentrated on the thickest areas of an oil slick and Woodside intends on applying surface dispersants to only BAOAC 4 and 5. Spraying areas of oil designated as BAOAC Code 4 (Discontinuous true oil colour) with dispersant will, on average, deliver approximately the recommended treatment rate of dispersant.

Spraying areas of oil designated as BAOAC Code 5 with dispersant (Continuous true oil colour and more than 0.2 mm thick) will, on average, deliver approximately half the recommended treatment rate of dispersant. Repeated application of these areas of thicker oil, or increased dosage ratios, will be required to achieve the recommended treatment rate of dispersant (EMSA 2012).

Guidance from the National Oceanic and Atmospheric Administration (NOAA) in the United States is found in the document: *Characteristics of Response Techniques: A Guide for Spill Response Planning in Marine Environments 2013 (NOAA 2013).* This guide outlines advice for response planning across all common techniques, including surface dispersant spraying and containment and recovery. It states that oil thickness can vary by orders of magnitude within distinct areas of a slick, thus the actual slick thickness and oil distribution of target areas are crucial for determining response method feasibility. Further to this, ITOPF also states that in terms of oil spill response, sheen can be disregarded as it represents a negligible quantity of oil, cannot be recovered or otherwise dealt with to a significant degree by existing response techniques, and is likely to dissipate readily and naturally (ITOPF, 2014).

**Figure 2-3** below from AMSA's Identification of Oil on Water – Aerial Observation and Identification Guide (AMSA, 2014) shows expected percent coverage of surface hydrocarbons as a proportion of total surface area. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

From this information and other relevant sources (Allen and Dale, 1996, EMSA, 2012, Spence, 2018) the surface threshold of 50g/m$^2$ was chosen as an average / equilibrium thickness (50g/m$^2$ is an average is 50% coverage of 0.1mm Bonn Agreement Code 4 - discontinuous true oil colour, or 25% coverage of 0.2mm Bonn Agreement Code 5 – continuous true oil colour which would represent small patches of thick oil or wind-rows.

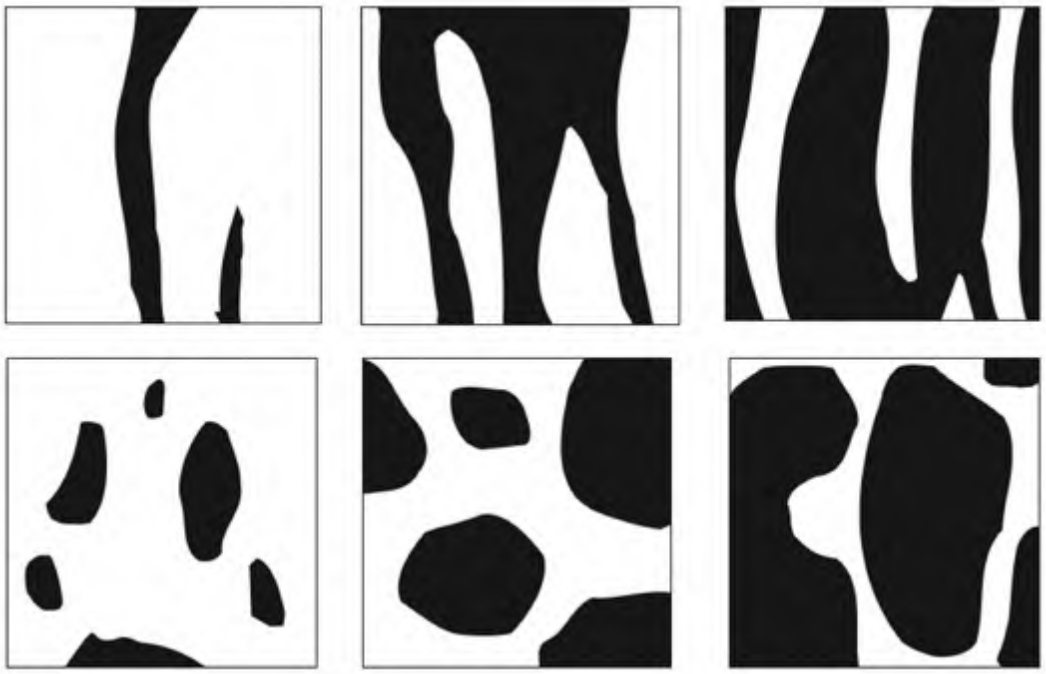


**Figure 2-3: Proportion of total area coverage (AMSA, 2014)**

**Figure 2-4** illustrates the general relationships between on-water response techniques and slick thickness. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

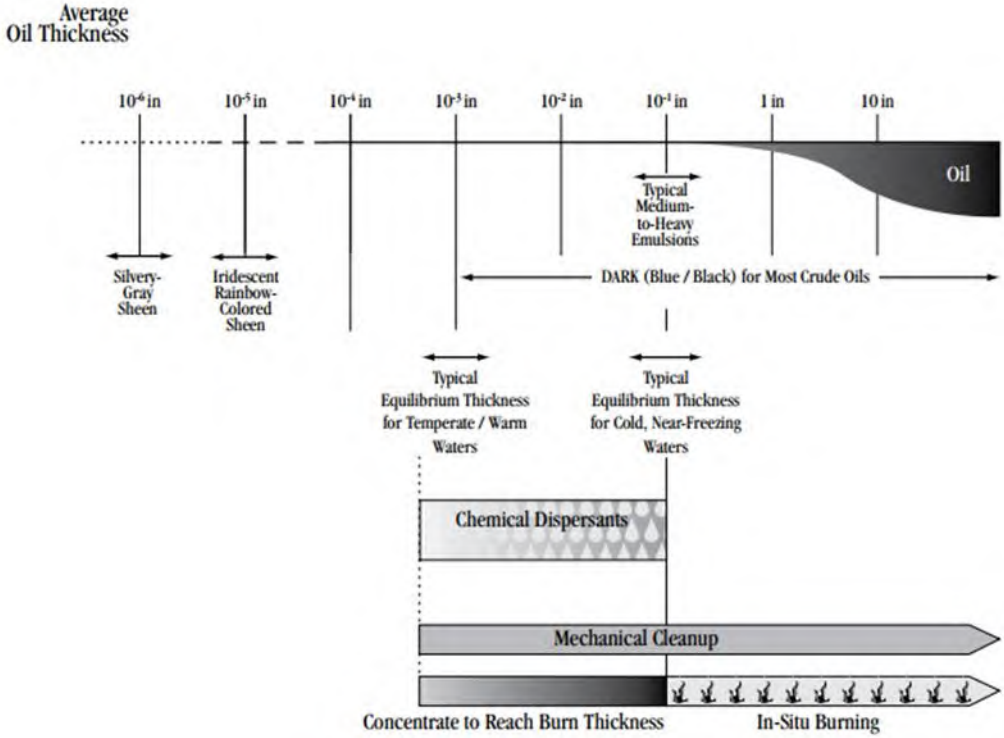


**Figure 2-4: Oil thickness versus potential response options (from Allen & Dale 1996)**

Wind and waves influence the feasibility of mechanical clean-up operations, dropping the effectiveness significantly because of entrainment and/or splash-over as short period waves develop

beyond two to three feet (0.6–0.9 m) in height. Waves and wind can also be limiting factors for the safe operation of vessels and aircraft.

### 2.3.3.2 Surface hydrocarbon viscosity

**Table 2-4: Surface hydrocarbon viscosity thresholds**

| Surface viscosity (cSt) | Description | European Maritime Safety Authority (EMSA) | Viscosity at sea temperature (cSt) |
|---|---|---|---|
| 5,000 | Predicted optimum viscosity for surface dispersant operations | Generally possible to disperse | 500-5000 |
| 10,000 | Predicted maximum viscosity for effective surface dispersant operations | Sometimes possible to disperse | 5,000-10,000 |

Further to the required thickness for surface dispersant application and containment and recovery to be deployed effectively as outlined above, changes to viscosity will also limit the treatment of offshore response techniques. As outlined in the EMSA Manual on the Applicability of Oil Spill Dispersants (EMSA, 2012), guidance around changes to viscosity and likely effectiveness of surface dispersant application is provided.

This includes the following statements; “It has been known for many years that it is more difficult to disperse a high viscosity oil than a low or medium viscosity oil. Laboratory testing had shown that the effectiveness of dispersants is related to oil viscosity, being highest for modern “Concentrate, UK Type 2/3” dispersants at an oil viscosity of about 1,000 or 2,000 mPa.s (1,000 – 2,000 cSt) and then declining to a low level with an oil viscosity of 10,000 mPa.s (10,000 cSt). It was considered that some generally applicable viscosity limit, such as 2,000 or 5,000 mPa.s (2,000 – 5,000 cSt), could be applied to all oils.”

However, modern oil spill dispersants are generally effective up to an oil viscosity of 5,000 mPa.s (5,000 cSt) or more, and their performance gradually decreases with increasing viscosity; oils with a viscosity of more than 10,000 are, in most cases, no longer dispersible. Guidance from EMSA (2012) also indicates that products with a range of 500 – 5,000 cSt at sea temperature are generally possible to disperse, while 5,000 – 10,000 cSt at sea temperature above pour point are sometimes possible to disperse, with products beyond 10,000 cSt at sea temperature below pour point are generally impossible to disperse.

To support decision making and response planning, a threshold of 10,000 cSt at sea temperature was chosen as a conservative estimate of maximum viscosity for surface dispersant spraying operations.

The thresholds described above are compared with the modelling results for the WCCS (**Table 2-5**).

### 2.3.4 Spill modelling results

Details of the scenario, selected stochastic modelling inputs and results are included in **Table 2-5**.

**Table 2-5: Worst case credible scenario modelling results**

| Response parameter | Modelled result | |
|---|---|---|
| | **CS-01: Marine diesel release caused by vessel collision** | **CS-03: Loss of well control during drilling of development well** |
| Maximum instantaneous liquid hydrocarbon release rate and duration | Modelled instantaneous surface release of 250 $m^3$ marine diesel. | N/A – dry gas with no liquid hydrocarbons |
| Maximum residual surface hydrocarbon after weathering | 12.5 $m^3$ | N/A – dry gas |
| **Modelling results** | | |
| Minimum time to commencement of hydrocarbon accumulation at any shoreline receptor (at a threshold of 100 $g/m^2$) | No contact at threshold | N/A – dry gas |
| Minimum time to floating hydrocarbon contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 $g/m^2$) | No contact at threshold | N/A – dry gas |
| Maximum cumulative hydrocarbon volume accumulated at any individual shoreline receptor | No contact at threshold | N/A – dry gas |
| Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors contacted by accumulated hydrocarbons (including those contacted at <100 $g/m^2$ accumulation concentration) | No contact at threshold | N/A – dry gas |
| Minimum time to entrained/dissolved hydrocarbon contact with the offshore edges of any receptor polygon (at a threshold of 100 ppb/50 ppb) | 55 hours at Gascoyne Australian Marine Park (AMP) for entrained hydrocarbon contact/ No contact at threshold for dissolved hydrocarbon | N/A – dry gas |

The stochastic modelling results for the worst case credible scenario are summarised as follows:

- Surface hydrocarbon concentrations equal to or greater than 10 $g/m^2$ are predicted to extend up to 52 km from the release location. No contact with sensitive receptors is predicted at this threshold.
- No shoreline receptors are predicted to be contacted by floating oil concentrations at any of the assessed thresholds.
- No accumulation of oil on shorelines is predicted.
- The Gascoyne Australian Marine Park (AMP) is predicted to receive entrained oil concentrations at the 100 ppb threshold with a probability of 4% after 55 hours.

Spreading and weathering of the surface oil occurs rapidly due to the loss of light, volatile components and the spreading. Dispersant application and containment and recovery are not appropriate for use on spills of marine diesel due to these weathering characteristics.

# 3 IDENTIFY RESPONSE PROTECTION AREAS (RPAs)

In a response, operational monitoring programs – including trajectory modelling and vessel/aerial observations – would be used to predict RPAs that may be impacted. For the purposes of planning and appropriately scaling a response, modelling has been used to identify RPAs as outlined below in Figure 3-1.

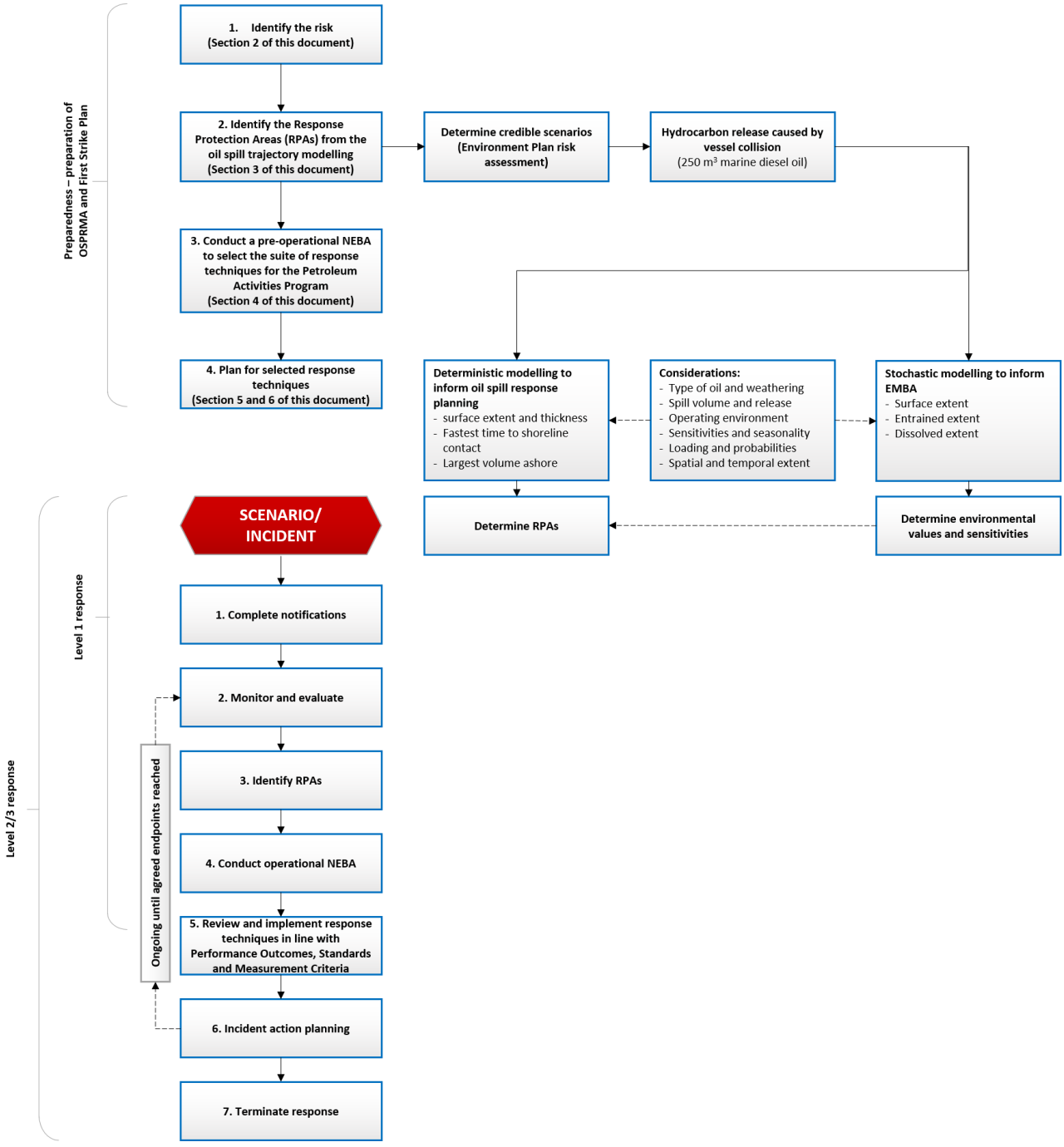


**Figure 3-1: Identify RPAs flowchart**

## 3.1 Identified Sensitive Receptor Locations

Section 6 of the EP includes the list of sensitive receptor locations that have been identified by stochastic modelling as meeting the requirements outlined below:

- Receptors with the potential to incur surface, entrained or shoreline accumulation contact above environmental impact thresholds.
- Receptors within the EMBA which meet the following:
  - A number of priority protection criteria/categories
  - International Union of Conservation of Nature (IUCN) marine protected area categories
  - High conservation value habitat and species
  - Important socio-economic/heritage value.

### 3.1.1 Identify Response Protection Areas

From the identified sensitive receptors described in Section 6 of the EP, only those which a shoreline response could feasibly be conducted (accumulation >100 g/m$^2$ for shoreline assessment and/or contact with surface slicks >10 g/m$^2$ for operational monitoring) are selected for response planning purposes.

### 3.1.2 Response Protection Areas

Response Protection Areas (RPAs) are selected on the basis of their environmental (ecological, social, economic, cultural and heritage) values and sensitivities and considering the minimum response thresholds and the ability to conduct a response based on the minimum response thresholds (**Section 2.3.3**).

Contact from floating hydrocarbons above 10 g/m$^2$ is not predicted for any shoreline receptor based on the stochastic modelling. Additionally, accumulation above 100 g/m$^2$ on any shoreline is not predicted and no accumulated volume of hydrocarbons is predicted at any shorelines. Consequently, no RPAs have been selected for response planning.

For this PAP deterministic modelling was not required because the stochastic spill modelling predicted no contact with shoreline from floating oil.

# 4 NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

A NEBA is a structured process to consider which response techniques are likely to provide the greatest net environmental benefit.

The NEBA process typically involves four key steps outlined in **Figure 4-1**: evaluate data, predict outcomes, balance trade-offs, and select response options. These steps are followed in the planning/preparedness process and would also be followed in a response.

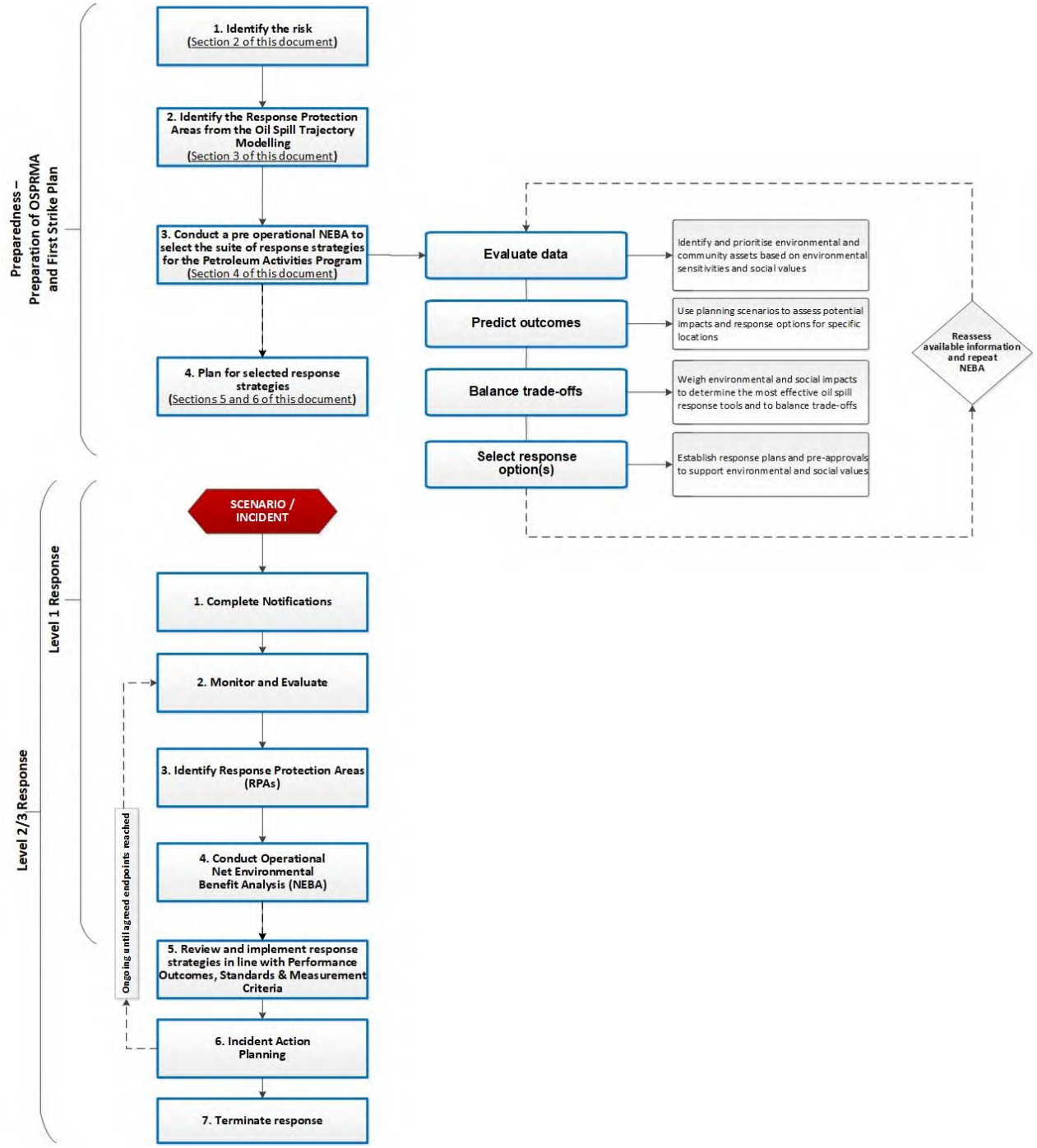


**Figure 4-1: Net Environmental Benefit Assessment (NEBA) flowchart**

## 4.1 Pre-operational / strategic NEBA

The pre-operational NEBA identifies positive and negative impacts to sensitive receptors from implementing the response techniques. Feasibility is considered by assessing the receptors potentially impacted above response thresholds (Section 2.3.3).

Completing a pre-operational NEBA is a key response planning control that reduces the environmental risks and impacts of implementing the selected response techniques. Comprehensive details of the pre-operational NEBA for this PAP are contained in **ANNEX A: Net Environmental Benefit Analysis detailed outcomes**.

## 4.2 Stage 1: Evaluate data

Woodside identifies and prioritises environmental and community assets based on environmental sensitivities and social values, informed through the use of trajectory modelling. Interpretation of stochastic oil spill modelling determines the EMBA for the release, which defines the spatial area that may be potentially impacted by the PAP activities.

### 4.2.1 Define the scenario(s)

Woodside uses scenarios identified from the risk assessment in the EP to assess potential impacts and response options for specific locations. The WCCS is then selected for deterministic modelling (if required) and is used for this pre-operational NEBA. For this PAP deterministic modelling was not required because the stochastic spill modelling did not predict floating oil at >50 g/m$^2$ or contact with shoreline at 100 g/m$^2$.

Outlier locations with potential environmental impacts, selected from the stochastic modelling may also be included for assessment. Response thresholds and modelling results are then used to assess the feasibility/effectiveness and scale of the response.

**Table 4-1: Scenario summary information (WCCS)**

| **Scenario summary information (CS-01)** | |
|---|---|
| **Scenario** | Short-term uncontrolled release of marine diesel from a vessel collision |
| **Location** | 19° 55’ 33.60”, S 113° 14’ 31.20” E |
| **Oil Type** | Marine Diesel |
| **Fate and Weathering** | Refer to **Section 2.2.1** |
| **Volume of release** | 250 m$^3$ - instantaneous |
| **Scenario summary information (CS-03)** | |
| **Scenario** | Loss of well control during drilling of development well |
| **Location** | 19° 55’ 33.60”, S 113° 14’ 31.20” E |
| **Oil Type** | Dry gas |
| **Fate and Weathering** | N/A – dry gas |
| **Volume of release** | Dry gas release – no liquid hydrocarbon. |

### 4.2.2 Determining potential response options

The available response techniques based on current technology can be summarised under the following headings:

- Monitor and evaluate (including operational monitoring)
- Vessel source control
- Source control
  - Remotely operated vehicle (ROV) intervention
  - debris clearance and/or removal
  - capping stack
  - containment dome
  - relief well drilling
- Subsea dispersant injection
- Surface dispersant application:
  - aerial dispersant application
  - vessel dispersant application
- Containment and recovery
- Mechanical dispersion
- In-situ burning
- Shoreline protection and deflection:
  - protection
  - deflection
- Shoreline clean-up:
  - Phase 1 – Mechanical clean-up
  - Phase 2 – Manual clean-up
  - Phase 3 – Final polishing
- Oiled wildlife response
- Waste management
- Post spill monitoring/scientific monitoring

An assessment of which response options are feasible for the scenarios is included below in Table 4-2. Against the scenario's parameters, including oil type, volume and characteristics, prevailing weather conditions, logistical support, and resource availability to determine their deployment feasibility.

A shortlist of the feasible response options is then carried forward for the ALARP assessment with a justification for the exclusion of other response techniques included in Section 4.2.3. This assessment will typically result in a range of available options, that are deployed at different areas (at-source, offshore, nearshore and onshore) and times through the response. The NEBA process assists in prioritising which options to use where and when and timings throughout the response.

**Table 4-2: Response technique evaluation – Marine Diesel (CS-01)**

| Response Technique | Effectiveness | Feasibility | Decision | Rationale for the decision |
|---|---|---|---|---|
| **Hydrocarbon: Marine Diesel** | | | | |
| **Monitor and Evaluate** | Will be effective in tracking the location of the spill, predicting potential impacts and triggering further monitoring and response techniques as required.<br>Operational Monitoring (OM) techniques include:<br>• OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques.<br>• OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill.<br>• OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill.<br>• OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk.<br>• OM05 Shoreline assessment – once OM02, OM03 and OM04 inform which RPAs have been impacted. | Monitoring of a Marine Diesel spill is a feasible response technique and outputs will be used to guide decision making on the use of other monitoring/response techniques and providing information to regulatory agencies including AMSA and Western Australia's Department of Transport (WA DoT). | **Yes** | Monitoring the spill will be necessary to:<br>• Validate trajectory and weathering models<br>• Determine the behaviour of the oil in water<br>• Determine the location and weathering condition of the slick<br>• Provide forecasts of spill trajectory<br>• Determine appropriate response techniques<br>• Determine effectiveness of response techniques<br>• Confirm impact pathways to receptors |
| **Source Control (vessel)** | Controlling the spill of diesel at source would be the most effective way to limit the quantity of hydrocarbon entering the marine environment. | A spill of diesel from a vessel collision will be instantaneous and source control will be limited to what the vessel can achieve whilst responding to the incident. | **Yes** | Ability to stop the spill at source will be dependent upon the specific spill circumstances and whether or not it is safe for response personnel to access/isolate the source of the spill. |
| **Surface Dispersant Application** | Dispersants are not considered effective when applied on thin surface films such as marine diesel as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon. | Marine diesel is prone to rapid spreading and evaporation thus the use of dispersant would be deemed an unnecessary response technique. | **No** | The application of dispersant to marine diesel is unnecessary as the diesel will rapidly evaporate and would thus unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons. |
| **Containment and Recovery** | Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5. Containment and recovery requires a spill to be BAOAC 4 or 5 with a 50-100% coverage of 100 g/m$^2$ to 200 g/m$^2$. | Marine diesel is prone to rapid spreading and evaporation thus reducing the feasibility of containment and recovery as a response technique. | **No** | Containment and recovery would be an inappropriate response technique as the coverage requirements would not be achieved by a marine diesel spill.<br>In addition, most of the spilled diesel would have been subject to rapid evaporation and entrainment prior to the commencement of containment and recovery operations. |
| **Mechanical dispersion** | Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages. | Although the technique is feasible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly.<br>The volatile nature of the oil is also likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon.<br>Additionally, any vessel used for mechanical dispersion activities would be contaminated by the hydrocarbon and could potentially cause secondary contamination of unimpacted areas when exiting the spill area.<br>The decontamination of a vessel used for mechanical dispersion activities would result in additional quantities of oily waste requiring appropriate handling and treatment. | **No** | Given the limited benefit of mechanical dispersion over natural wind and wave action, secondary contamination and waste issues, and the associated safety risk of implementing the response for this activity, this strategy is deemed unsuitable. |
| **In-situ Burning** | In-situ burning is only effective where minimum slick thickness can be achieved. | Use of in-situ burning as a response technique for marine diesel is unfeasible as the minimum slick thickness cannot be attained due to rapid spreading. In addition, there is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which is unlikely to be achieved. Furthermore, entering a volatile environment to undertake this technique would be unsafe for response personnel. | **No** | Diesel characteristics are not appropriate for the use of in-situ burning as the minimum thickness will not be attained due to rapid spreading. Furthermore, it would unnecessarily cause an increase in the release of atmospheric pollutants. |
| **Shoreline Protection and Deflection** | Shoreline protection and deflection can be effective at preventing contamination of at-risk areas. | Use of shoreline protection and deflection for a spill of marine diesel is unlikely to provide any significant environmental benefit as the diesel will be subject to rapid spreading and evaporation prior to contact with any sensitive areas. | **No** | The modelling undertaken predicts that no shorelines will be impacted thus it is unlikely that this technique would be required. |

| Response Technique | Effectiveness | Feasibility | Decision | Rationale for the decision |
|---|---|---|---|---|
| | | The modelling undertaken predicts no shoreline receptors are to be contacted by floating oil concentrations at any of the assessed thresholds and no accumulation of oil on shorelines, therefore shoreline protection and deflection does not require consideration. | | |
| **Shoreline Clean up** | Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines where coverage is at an optimum level of 250 g/m$^2$. | A marine diesel spill would be prone to rapid spreading and evaporation prior to impacting any sensitive receptors. Operational monitoring will, however, be deployed from the outset of a spill to track the spill location and fate in real-time.<br>The modelling undertaken predicts no shoreline receptors are to be contacted by floating oil concentrations at any of the assessed thresholds and no accumulation of oil on shorelines, therefore shoreline protection and deflection does not require consideration. | **No** | The modelling undertaken predicts that no shorelines will be impacted thus it is unlikely that this technique would be required. |
| **Oiled Wildlife** | Oiled wildlife response is an effective response technique for reducing the overall impact of a release on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination.<br>Air-breathing fauna such as marine mammals are most at risk from surface exposures due to the high volatile components. Marine mammals that have direct physical contact with surface, entrained or dissolved aromatic hydrocarbons may suffer surface fouling, ingest hydrocarbons and inhale toxic vapours. | Due to the likely volatile atmospheric conditions surrounding a diesel spill, response options would be limited to hazing to ensure the safety of response personnel. In addition, any rehabilitation could only be undertaken by trained specialists. | **Potentially** | The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. However, in the event that wildlife are at risk of contamination, oiled wildlife response will be undertaken as and where required. |

**Table 4-3: Response technique evaluation – dry gas release from loss of well control (CS-03)**

| Response technique | Effectiveness | Feasibility | Decision | Rationale for the decision |
|---|---|---|---|---|
| **Hydrocarbon: Dry Gas** | | | | |
| **Monitor and evaluate** | For a dry gas release, established (liquid hydrocarbon) spill monitoring techniques are not applicable.<br>Monitoring the gas plume via the ROV sonar tool may be effective, in conjunction with other well information, in determining appropriate source control techniques.<br>If the plume breaches the surface, gas monitoring at the surface will be effective in ensuring atmospheric volatiles remain below safe operating levels and may be used to direct simultaneous operations (SIMOPS). | Monitoring the gas plume may be feasible where safe access via the ROV can be achieved and line of (sonar) sight is achievable to observe the gas plume. Outputs may be used to guide decision making on the use of source control techniques including options for safe and effective capping stack deployment, and relief well execution.<br>Although modelling of the gas release for CS-03 predicts the plume will not breach the water's surface, gas monitoring at the surface is a feasible practice and may be undertaken via the support vessels' gas monitoring equipment. | **Yes** | If feasible and safe, monitoring the gas plume via ROV and gas monitoring at the surface may:<br>• determine the behaviour of the plume<br>• monitor the surface plume (if water's surface is breached)<br>• determine appropriate source control response techniques<br>• inform on effectiveness of response techniques<br>• ensure safety of response personnel<br>• guide SIMOPS |
| **Source control via blowout preventer (BOP) intervention** | Controlling a loss of well containment at source via BOP intervention would be the most effective way to limit the quantity of methane being released. | In the event of the worst-case scenario with a loss of well control during drilling operations, ROV operations to locally operate the BOP would be attempted. | **Yes** | The use of source control intervention via ROV may be feasible and would reduce quantity of methane released.<br>This is the primary, feasible option to stop the flow from the well. |
| **Source control via debris clearance and capping stack** | Controlling a loss of well containment at source via capping stack would be an effective way to limit the quantity of hydrocarbon entering the marine environment.<br>If the ROV intervention on the BOP is unsuccessful, the deployment of a capping stack will be the secondary feasible option to stop the flow from the well. | Woodside has developed a project specific capping stack deployment plan and also commissioned an independent, capping stack landing study for the Scarborough wells (Wild Well Control Inc (WWCI), 2021). The study indicates that deployment of the capping stack is feasible.<br>Woodside maintains several frame agreements with various vessel service providers and maintains the ability to call off services with a capping stack and debris clearance agreement. The location of suitable vessels for capping stack deployment are monitored monthly. The supply arrangements and reliability to achieve the required mobilisation time will be revalidated prior to spud. Consideration to mobilise the capping stack from the supplier on a suitable vessel but then hand over to another vessel to conduct the capping activity will also be made to meet response time frames. A site-specific landing force analysis through | **Yes** | Conventional/vertical capping stack deployment with a heavy lift vessel is feasible once metocean conditions (wind, waves etc) are appropriate for safe deployment. Since the produced gas does not breach the sea surface, the response to the incident should not be unduly hampered by plume conditions. |

| Response technique | Effectiveness | Feasibility | Decision | Rationale for the decision |
|---|---|---|---|---|
| **Hydrocarbon: Dry Gas** | | | | |
| | | computational fluid dynamic (CFD) modelling confirms the ability to land the capping stack on either a Xmas tree or BOP. | | |
| **Source control via relief well drilling** | A subsea release of methane will be stopped approximately 65.3 days after the release. Relief well drilling will be the tertiary option to stop the flow from the well. | Relief well drilling is a widely accepted and utilised technique. The modelled worst-case discharge rate ('blowout rate') will require additional equipment to deliver the required kill rate to the relief well; this includes a second mobile offshore drilling unit (MODU), subsea well kill spools and hoses. | **Yes** | Relief well drilling is a proven technique employed to control a loss of well containment event should the other containment measures be unsuccessful. |
| **Subsea Dispersant Injection** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |
| **Surface dispersant application** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |
| **Mechanical dispersion** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |
| **In-situ burning** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |
| **Containment and recovery** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |
| **Shoreline protection and deflection** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |
| **Shoreline clean-up** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |
| **Oiled wildlife response** | Not applicable for a dry gas LOWC. | Not applicable for a dry gas LOWC. | **No** | Not applicable for a dry gas LOWC. |

### 4.2.3 Exclusion of response techniques

Response techniques that are not feasible for a hydrocarbon loss of containment are detailed in the subsections below, and are therefore excluded from further assessment within this document.

#### 4.2.3.1 Subsea dispersant application

Subsea dispersant application is not applicable for surface release of marine diesel.

Subsea dispersant application is not applicable for dry gas release.

#### 4.2.3.2 Surface dispersant application

Modelling results for a hydrocarbon release of marine diesel caused by a vessel collision (CS-01) show that surface thresholds for surface dispersant application will not be reached. Given the prediction of rapid and 95% evaporation of the oil dispersant surface application will be ineffective.

Surface dispersant application is not applicable for dry gas release.

#### 4.2.3.3 Containment and recovery

Modelling results for a marine diesel release from a vessel collision indicate that surface thresholds required for containment and recovery (>50g/$m^2$) will not be reached. The effectiveness of containment and recovery is predicted to be very low based on offshore met-ocean conditions in the region, the inherent inefficiency of containment and recovery operations, and the light, volatile nature of the marine diesel.

Containment and recovery is not applicable for dry gas release.

#### 4.2.3.4 In-situ burning

This technique requires calm sea state conditions as are required for containment and recovery operations, which limits its feasibility offshore of Exmouth. Optimum weather conditions are <20 knot wind speed and waves <1 to 1.5 m with oil collected to a minimum 3mm thick layer. Due to the conditions offshore Exmouth it is expected that the ability to contain oil may be limited as the sea state may exceed the optimum conditions.

There are health and safety risks for response personnel associated with the containment and subsequent burning of hydrocarbons. It is also suggested that the residue from attempts to burn would sink, thereby posing a risk to the environment. The longer-term effects of burn residues on the marine environment are not fully understood and therefore, no assessment of the potential environmental impact can be determined.

Until further operational and environmental information becomes available, Woodside will not consider this option.

In-situ burning is not applicable for dry gas release.

#### 4.2.3.5 Mechanical dispersion

Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages. The volatile nature of the oil is likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. There are also secondary contamination and waste issues to consider.

Mechanical dispersion is not applicable for dry gas release.

#### 4.2.3.6 Shoreline protection and deflection

Shoreline surface contact (above thresholds), as a result of a hydrocarbon spill modelling conducted for this petroleum activity program, is not expected to occur. Therefore, shoreline protection and deflection is not considered to be required.

Shoreline protection and deflection is not applicable for dry gas release.

#### 4.2.3.7 Shoreline clean-up

Shoreline surface contact (above thresholds), as a result of a hydrocarbon spill modelling conducted for this petroleum activity program, is not expected to occur. Therefore, shoreline clean-up is not considered to be required.

Shoreline clean-up is not applicable for dry gas release.

### 4.3 Stage 2: Predict outcomes

Woodside uses planning scenarios to assess potential impacts and response options for specific locations. Locations with potential environmental impacts, selected from the stochastic modelling are included for assessment. Response thresholds and deterministic modelling are then used to assess the feasibility/effectiveness of a response.

### 4.4 Stage 3: Balance trade-offs

Woodside considers environmental impacts and response effectiveness/feasibility to determine the most effective oil spill response tools and balance trade-offs, using an automated NEBA tool. The tool considers potential benefits and impacts associated with a response at sensitive receptors and then considers the effectiveness/feasibility of the response to select the response techniques carried forward to the ALARP assessment.

### 4.5 Stage 4: Select best response options

To select the response technique, all the other stages in the NEBA process are considered and used to establish response plans and any pre-approvals to support protection of identified environmental and social values.

The response techniques implemented may vary according to a particular spill. The hydrocarbon type released and the sensitivities of the receptors (both ecological and socio-economic) may influence the response. The pre-operational NEBA broadly evaluates each response technique and supports decisions on whether they are feasible and of net environmental benefit. Response techniques that are not feasible or beneficial are rejected at this stage and not progressed to planning.

Further risks and impacts from implementing these selected response options are outlined in Section 7.

**Table 4-4: Selection and prioritisation of response techniques**

| Response planning scenario | Key characteristics for response planning (times are minimum times to contact for first receptor and/or shoreline contacted above response threshold) | Feasibility of response techniques | | | | | | | | | | | | | Outline response technique |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monitor and evaluate | Debris clearance | Source control – capping stack | Source control on the vessel | Source control – relief well drilling | Subsea dispersant injection | Surface dispersant application | Mechanical dispersion | In-situ burning | Containment and recovery | Shoreline protection and deflection | Shoreline cleanup | Oiled wildlife response | |
| CS-01: Instantaneous release of up to 250 $m^3$ marine diesel from a vessel collision (residual component of 0.4 $m^3$) | No shoreline accumulation above 100 $g/m^2$ | Yes | N/A | N/A | Yes | N/A | N/A | No | No | No | No | No | No | Potentially | Monitor and evaluate.<br>Initiate vessel source control if feasible.<br>Plan for oiled wildlife response and implement if oiled wildlife is observed. |
| CS-03: Loss of well control during drilling of development well<br>Dry gas release – no liquid hydrocarbon | N/A – dry gas | Potentially | Yes | Yes | N/A | Yes | No | No | No | No | No | No | No | No | Consider whether monitor and evaluate, via ROV and surface gas monitoring, is required an feasible.<br>Initiate debris clearance.<br>Initiate source control via capping stack.<br>Initiate relief well drilling. |

From the NEBA undertaken on the WCCS identified for the PAP, the primary response techniques are;

- Monitor and evaluate (CS-01, potentially feasible for CS-03)
- Source control – vessel SOPEP (CS-01)
- Debris clearance (CS-03)
- Source control – capping stack (CS-03)
- Source control – relief well drilling (CS-03)
- Oiled wildlife response (CS-01)

Additional response strategies would be considered based on the inputs and field reports from the monitoring activities. This may include:

- Waste management (all scenarios)
- Scientific monitoring programs (all scenarios)

# 5 HYDROCARBON SPILL ALARP PROCESS

Woodside's hydrocarbon spill ALARP process is aligned with guidance provided by NOPSEMA in *Oil Spill Risk Management Guidance Note N-04750-GN1488* (2021) and is set out in the 'Woodside Hydrocarbon Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) Development Guidelines'.

From the identified response planning need and pre-operational NEBA, Woodside conducts a structured, semi-quantitative hydrocarbon spill process which has the following steps:

1. Considers the Response Planning Need identified in terms of surface area ($km^2$) and available surface hydrocarbon volumes ($m^3$) against existing Woodside capability.
2. Considers alternative, additional, and improved options for each response technique/control measure by providing an initial and, if required, detailed evaluation of
    - Predicted cost associated with adopting the control measure,
    - Predicted change/environmental benefit, and
    - Predicted effectiveness/feasibility of the control measure.
3. Evaluates the risks and impacts of implementing the proposed response techniques, and any further control measures with associated environmental performance to manage these additional risks and impacts.

Woodside considers the risks and impacts from a hydrocarbon spill to have been reduced to ALARP when:

1. A structured process for identifying and considering alternative, additional, and improved options has been completed for each selected response technique;
2. The analysis of alternate, additional, and improved control measures meets one of the following criteria:
    - All identified, reasonably practicable control measures have been adopted; or
    - No identified reasonably practicable additional, alternative and/or improved control measures would provide further overall increased proportionate environmental benefit; or
    - No reasonably practical additional, alternative, and/or improved control measures have been identified.
3. Where an alternative, additional and/or improved control measure is adopted, a measurable level of environmental performance has been assigned.
4. Higher order impacts/ risks have received more comprehensive alternative, additional, and improved control measure evaluations and do not just compare the cost of the adopted control measures to the costs of an extreme or clearly unreasonable control measure.
5. Cumulative effects have been analysed when considered in combination across the whole activity.

The response technique selection is based on the risk assessment conducted in the EP. The risk assessment identifies the type of oil, volume of release, duration of release, predicted fate, weathering and the EMBA (along with other requirements such as time to impact and predicted volumes ashore). Modelling is then used to inform the NEBA and the prioritisation of suitable response options. The scale of the response techniques selected in the pre-operational NEBA is informed through the assessment of results from deterministic modelling. For the purpose of the ALARP assessment, the following terms and definitions have been used:

- Response techniques are considered the control measures that reduce consequences from hydrocarbon spill events. The terms ‘response technique’ and ‘control measure’ are used interchangeably.
- Cost is defined as the time, effort and/or trouble taken in financial, safety, design/storage/installation, capital/lease, and/or operations/maintenance terms to adopt a control measure.
- Where the predicted change to environmental impact is compared against standard environmental values and sensitivities impacts using positive or negative criteria from the NEBA Impact Ranking Classification Guidance in **ANNEX A: Net Environmental Benefit Analysis detailed outcomes**.

## 5.1 Monitor and evaluate (including operational monitoring)

Monitor and evaluate includes the gathering and evaluation of data to inform the oil spill response planning and operations. It includes fate and trajectory modelling, spill tracking, weather updates and field observations. This response option is deployed in some capacity for every hydrocarbon spill event. These techniques are not applicable for a dry gas, loss of well control event i.e. CS-03 and thus only apply to CS-01.

**Table 5-1** below provides the operations monitoring plans that support the successful execution of this response technique.

**Table 5-1: Description of supporting operational monitoring plans**

| ID | Title |
|---|---|
| OM01 | Predictive modelling of hydrocarbons to assess resources at risk |
| OM02 | Surveillance and reconnaissance to detect hydrocarbons and resources at risk |
| OM03 | Monitoring of hydrocarbon presence, properties, behaviour and weathering in water |
| OM04 | Pre-emptive assessment of sensitive receptors at risk |
| OM05 | Shoreline assessment |

Woodside maintains an *Operational Monitoring Operational Plan*. If shoreline contact is predicted, RPAs will be identified and assessed before contact. If shorelines are contacted, a shoreline assessment survey will be completed to guide effective shoreline clean-up operations. This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill.

The proximity of Exmouth to the spill event location means that multiple logistical options are available to monitor the spill in relatively short timeframes. The primary mobilisation base for initial monitoring activities would be Exmouth. However, in the event of an extended spill with potential to impact receptors further afield, monitoring activities may also be mobilised from Onslow, Dampier or Karratha.

### 5.1.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- No receptors are predicted to be contacted by floating oil concentrations at the 10 g/m$^2$ threshold.
- No shoreline receptors are predicted to be contacted by floating oil concentrations at any of the assessed thresholds.
- No accumulation of oil on shorelines is predicted.
- The time to contact for oil at concentrations of entrained hydrocarbons greater than 100 ppb at shoreline receptors is 55 hours at the Gascoyne AMP.
- Arrangements for support organisations who provide specialist services or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for Operational and additional support techniques. These should be reviewed and updated regularly.

### 5.1.2 Environmental performance based on need

**Table 5-2: Environmental Performance – Monitor and Evaluate**

| **Environmental Performance Outcome** | | To gather information from multiple sources to establish an accurate common operating picture as soon as possible and predict the fate and behaviour of the spill to validate planning assumptions and adjust response plans as appropriate to the scenario. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 1 | Oil spill trajectory modelling | 1.1 | Initial modelling available within 6 hours using the Rapid Assessment Tool | 1, 3B, 3C, 4 |
| | | 1.2 | Detailed modelling available within 4 hours of RPS receiving information from Woodside | |
| | | 1.3 | Detailed modelling service available for the duration of the incident upon contract activation | |
| 2 | Tracking buoy | 2.1 | Tracking buoy located on facility/vessel and ready for deployment 24/7 | 1, 3A, 3C, 4 |
| | | 2.2 | Deploy tracking buoy from facility within 2 hours as per the First Strike Plan. | 1, 3A, 3B, 4 |
| | | 2.3 | Contract in place with service provider to allow data from tracking buoy to be received 24/7 and processed. | 1, 3B, 3C, 4 |
| | | 2.4 | Data received to be uploaded into Woodside Common Operating Picture (COP) daily to improve the accuracy of other monitor and evaluate techniques. | 1, 3B, 4 |
| 3 | Satellite imagery | 3.1 | Contract in place with 3rd party provider to enable access and analysis of satellite imagery. Imagery source/type requested on activation of service. | 1, 3C, 4 |
| | | 3.2 | 3rd party provider will confirm availability of an initial acquisition within 2 hours | 1, 3B, 3C, 4 |
| | | 3.3 | First image received with 24 hours of Woodside confirming to 3rd party provider its acceptance of the proposed acquisition plan. | 1 |
| | | 3.4 | 3rd party provider to submit report to Woodside per image. Report is to include a polygon of any possible or identified slick(s) with metadata. | 1 |
| | | 3.5 | Data received to be uploaded into Woodside COP daily to improve accuracy of other monitor and evaluate techniques. | 1, 3B, 4 |
| | | 3.6 | Satellite Imagery services available and employed during response | 1, 3C, 4 |
| 4 | Aerial surveillance | 4.1 | Two trained aerial observers available to be deployed by day 1 from resource pool. | 1, 2, 3B, 3C, 4 |
| | | 4.2 | One aircraft available for two sorties per day, available for the duration of the response from day 1 | 1, 3C, 4 |
| | | 4.3 | Observer to compile report during flight as per first strike plan. Observers report available to the IMT within 2 hours of landing after each sortie. | 1, 2, 3B, 4 |
| 5 | Hydrocarbon detections in water | 5.1 | Activate 3rd party service provider as per first strike plan. Deploy resources within 2.5 days:<br>• Three specialists in water quality monitoring<br>• Two monitoring systems and ancillaries<br>• One vessel for deploying the monitoring systems with a dedicated winch, A-frame or Hiab and ancillaries to deploy the equipment. | 1, 2, 3C, 3D, 4 |
| | | 5.2 | Water monitoring services available and employed during response | 1, 3C, 4 |
| | | 5.3 | Preliminary results of water sample as per contractor's implementation plan within 7 days of receipt of samples at the accredited lab | |
| | | 5.4 | Daily fluorometry reports as per service provider's implementation plan will be provided to IMT to validate modelling and monitor presence/absence of entrained hydrocarbons. | |
| | | 5.5 | Use of Autonomous Underwater Vehicles (AUVs) for hydrocarbon presence and detection may be used as a contingency if the operational NEBA confirms conventional methods are unsafe or not possible. | 1, 2, 3C, 4 |
| 6 | Pre-emptive assessment of sensitive receptors | 6.1 | Within 10 days, deployment of two specialists from resource pool in establishing the status of sensitive receptors. | 1, 2, 3B, 3C, 4 |
| | | 6.2 | Daily reports provided to IMT on the status of the receptors to prioritise RPAs and maximise effective utilisation of resources | 1, 3B, 4 |

| **Environmental Performance Outcome** | | To gather information from multiple sources to establish an accurate common operating picture as soon as possible and predict the fate and behaviour of the spill to validate planning assumptions and adjust response plans as appropriate to the scenario. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 7 | Management of environmental impact of the response risks | 7.1 | If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified. | 1 |
| | | 7.2 | Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines | |

The control measures and capability of Woodside and its third-party service providers are shown to support Monitor and Evaluate activities up to and including the identified WCCS. This is demonstrated by the following:

- Woodside has a documented, structured and tested capability for Monitor and Evaluate operations including internal trajectory modelling capabilities, tracking buoys located offshore and contracted aerial observation platforms with access to trained observers.
- Woodside and its third-party service providers ensure there is sufficient capability for the duration of the response.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.
- The health and safety, financial, capital and operations/maintenance costs of implementing the alternative, additional or improved control measures identified and not carried forward are considered grossly disproportionate to the environmental benefit gained and/or not reasonably practicable for this PAP.
- The Monitor and Evaluate capability outlined in this section is part of the response developed to manage potential risks and impacts associated with the scenarios to ALARP, and there are no further additional, alternative and improved control measures other than those implemented that would provide further benefit.

## 5.2 Source control via vessel SOPEP

Vessel source control will be conducted, where feasible and in accordance with International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 Annex I, by the Vessel Master under the SOPEP triggered by any loss of containment from the PAP vessels.

The SOPEP provides guidance to the Master and Officers on board the vessel with respect to the extra steps to be taken when an unexpected pollution incident has occurred or is likely to occur. The SOPEP contains all information and operational instructions required by International Marine Organisation (IMO) Resolution MEPC.54 (32) adopted on 6 March 1992, as amended by resolution MEPC.86 (44) adopted on 13 March 2000.

Its purpose is to set in motion the necessary actions to stop or minimise oil discharge and mitigate its effects and outlines responsibilities, pollution reporting requirements, procedures and resources needed in the event of a hydrocarbon spill from vessel activities.

In the event of a potential vessel collision, the vessel master may engage precautionary marine manoeuvres to avoid collision or commence pumping operations to transfer marine diesel and thus minimise the release.

### 5.2.1 Environmental performance based on need

Woodside has established control measures, environmental performance outcomes, performance standards and measurement criteria to be used for vessel-source oil spill response during the PAP which are detailed in Section 6.7 of the EP. The vessel master's roles and responsibilities are described in EP Section 7.3.

Performance standards for each contracted PAP vessel are detailed in the vessel's specific SOPEP.

These standards ensure that sufficient resources are available and are adequately tested to ensure implementation of the SOPEP in the event of a hydrocarbon spill.

## 5.3 Source control and well intervention

The worst-case credible scenario for a loss of well containment is considered to be loss of well control during drilling operations. This scenario would result in an uncontrolled flow of dry gas from the well as outlined in the EP. In the event of a loss of well containment, the primary response would be source control and well intervention.

The Scarborough *Source Control Emergency Response Plan* (SCERP) has been developed as part of the Woodside assurance plans and in alignment with the guidelines in the *NOPSEMA Source Control Planning and Procedures Information Paper* (N-04750-IP1979 A787102). It includes the process for the IMT to mobilise resources for BOP intervention, Subsea First Response Toolkit (SFRT) support, and capping support. This plan has pre-identified vessel specifications and contracts required for SFRT debris clearance work and Woodside monitors the availability and location of these vessels.

Woodside is a signatory to a MoU between Australian offshore operators to provide mutual aid to facilitate and expedite mobilising a MODU and drilling a relief well, if a loss of well containment incident were to occur. The MoU commits the signatories to share rigs, equipment, personnel and services to assist another operator in need. Moored and Dynamically Positioned (DP) MODUs are suitable for the Scarborough wells.

Source control operations cannot be implemented if the safety of response personnel cannot be guaranteed. Circumstances that limit the safe execution of this control measure include lower explosive limit (LEL) concentrations, volatile concentrations of hydrocarbons in the atmosphere, weather window, waves and/or sea states (>1.5m waves) and high ambient temperatures. As the dry gas plume for the PAP is not predicted to breach the water's surface, LEL concentrations and volatile concentrations of hydrocarbons in the atmosphere are unlikely to pose a safety issue for response personnel. Gas monitoring will, however, be undertaken in line with standard protocol.

### 5.3.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Prior to any source control activities, Woodside will implement protocols to ensure that the site is safe including subsea ROV surveys and surface air monitoring.
- Hydrocarbons will flow from the well until one of the following interventions can be made:
  - closure of the tubing retrievable safety valve (TRSV) if present (only present after installation of the completion)
  - closure of a BOP ram (by ROV)
  - intervention with a capping stack
  - a relief well is drilled and first attempt at well kill within 65.3 days.
- Arrangements for support organisations who provide specialist services or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.
- The duration of the spill may be up to 65.3 days.

In addition, a number of assumptions are required to estimate the response need for source control. These assumptions have been described in the table below.

**Table 5-3: Response Planning Assumptions – Source Control**

| Response planning assumptions | |
|---|---|
| **Capping stack feasibility** | Woodside has developed a project specific capping stack deployment plan and also commissioned an independent, capping stack landing study for the Scarborough wells (WWCI, 2021). The study indicates that the safe deployment of a capping stack is feasible. |
| **Safety considerations** | Source control operations cannot be implemented if the safety of response personnel cannot be guaranteed. This requires an initial and ongoing risk assessment of health and safety hazards and risks at the site, in accordance with the Woodside Management System (WMS). Personnel safety issues may include:<br>• hydrocarbon gas and/or liquid exposure<br>• high winds, waves and/or sea states<br>• high ambient temperatures. |
| **Feasibility considerations** | Woodside's primary source control options would be ROV intervention and capping stack deployment. Relief well drilling operations will begin concurrently to provide an option to permanently abandon the well after the well flow is stopped.<br>The following approaches outline Woodside's hierarchy approach for selecting suitable MODU's for relief well operations;<br>• Primary – review internal drilling programs and MODU availability to source appropriate rig(s) operating within Australia with an approved Safety Case;<br>• Alternate – source and contract MODUs through Australian Petroleum Production & Exploration Association (APPEA) Memorandum of Understanding (MoU) that is operating within Australia with an approved Safety Case;<br>• Contingency – source and contract a MODU outside Australia with an approved Australian Safety Case |

### 5.3.2 Environmental performance based on need

**Table 5-4: Environmental Performance – Source Control**

| **Environmental Performance Outcome** | | **To stop the flow of hydrocarbons into the marine environment** | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 8 | Subsea First Response Toolkit (SFRT) | 8.1 | Oceaneering support staff available all year round, via contract, to assist with the mobilisation, deployment, and operation of the SFRT equipment. | 1, 3B, 3C |
| | | 8.2 | Intervention vessel with minimum requirement of a working class ROV and operator. | 1, 3C |
| | | 8.3 | Mobilised to site for deployment within 11 days. | 1, 3B, 3C |
| | | 8.4 | Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s). | 1, 3A, 3B |
| 9 | Well intervention | 9.1 | Frame agreements with ROV providers in place to be mobilised upon notification. ROV equipment deployed within 7 days. | 1, 3B, 3C |
| | | 9.2 | Source control vessel will have the following minimum specifications:<br>• active heave compensated crane, rated to at least 150 T in shallower water and 250 T in deeper water<br>• at least 90 m in length<br>• deck has water/electricity supply<br>• deck capacity to hold at least 110 T of capping stack. | 1, 3B, 3C |
| | | 9.3 | Identify source control vessel availability within 24 hours and begin contracting process. Vessel mobilised to site for deployment within 16 days for conventional capping. | 1, 3B, 3C |
| | | 9.4 | ROV available on MODU ready for deployment within 48 hours to attempt initial BOP well intervention. | 1, 3B, 3C |
| | | 9.5 | Hot Stab and/or well intervention attempt made using ROV and SFRT within 11 days. | 1, 3B, 3C |
| | | 9.6 | Capping stack on suitable vessel mobilised to site within 16 days. Deployment and well intervention attempt will be made once safety and metocean conditions are suitable. | 1, 3C |
| | | 9.7 | Wild Well Control Inc (WWCI) staff available all year round to assist with the mobilisation, deployment, and operation of the capping stack and well intervention equipment. | 1, 3B, 3C |
| | | 9.8 | MODU mobilised to site for relief well drilling within 21 days. | 1, 3C |
| | | 9.9 | First well kill attempt completed within 65.3 days. | 1, 3B, 3C |
| | | 9.10 | Open communication line(s) to be maintained between IMT and infield operations to ensure awareness of progress against plan(s). | 1, 3A, 3B |
| | | 9.11 | Relief Well Peer review undertaken during well design which includes screening and identification of suitable MODU(s) with in-force Australian safety cases for relief well drilling. | 1, 3C |
| | | 9.12 | Monthly monitoring of the availability of MODUs through existing market intelligence including current Safety Case history, to meet specifications for relief well drilling. Titleholders of suitable MODUs notified. | 3C |
| | | 9.13 | Prior to entering the reservoir, reconfirm that pre-identified/screened MODU(s) remain available for relief well drilling and engage titleholder. | 1, 3C |
| | | 9.14 | An activity-specific Source Control Emergency Response Plan will be in place prior to commencement of the campaign. | 1, 3A, 3C |
| | | 9.15 | An approved Relief Well Plan (as required by Relief Well Planning Procedure) shall exist prior to commencement of the campaign including: feasibility and any specific considerations for relief well kill and well capping. | 1, 3A, 3C |
| 10 | Support vessels | 10.1 | Monthly monitoring of availability of larger vessels through existing Frame Agreements and market intelligence to meet specifications for source control. | 3C |
| | | 10.2 | Frame agreements for Infield Support Vessels (ISVs) require vessels maintain in-force safety case approvals covering ROV operations and provide support in the event of an emergency. | 1, 3B, 3C |
| | | 10.3 | MODU and vessel contracts include clause outlining requirement for support in the event if an emergency | 1, 3C |

| Environmental Performance Outcome | | To stop the flow of hydrocarbons into the marine environment | | |
|---|---|---|---|---|
| Control measure | | Performance Standard | | Measurement Criteria |
| 11 | Safety case | 11.1 | Woodside will prioritise MODU or vessel(s) for intervention work(s) that have an existing safety case. | 1, 3C |
| | | 11.2 | Woodside Planning, Logistics, and Safety Officers (on-roster/ call 24/7) to assist in expediting the safety case assessment process as far as practicable. | 1, 3C |
| | | 11.3 | Woodside will maintain minimum safe operating standards that can be provided to MODU and vessel operators for safety case guidance. | 1, 3C |

The resulting source control capability has been assessed against the WCCS. The range of techniques provide a feasible and viable approach to well intervention and relief well drilling operations to stop the well flowing.

- The health and safety, financial, capital and operations/maintenance costs of implementing the alternative, additional or improved control measures identified and not carried forward are considered clearly disproportionate to the insignificant environmental benefit gained and/or not reasonably practicable for this PAP.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in **Section 6.2**.

## 5.4 Oiled wildlife response (including hazing)

Woodside would implement a response in accordance with the Western Australian *Oiled Wildlife Operational Plan* (WA OWRP). This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill. Oiled wildlife operations would be implemented with advice and assistance from the Oiled Wildlife Advisor from the Western Australia Department of Biodiversity, Conservation and Attractions (DBCA).

Oiled wildlife response is undertaken in accordance with the WA OWRP to ensure it is conducted in accordance with legislative requirements under the Animal Welfare Act 2002. If there is a net environmental benefit, oiled wildlife operations will be conducted 24 hours per day to reduce the time for rehabilitation and release of oiled wildlife. Hazing and pre-emptive capture techniques to keep non-oiled animals away from contaminated habitat in instances where it is deemed appropriate will be conducted in accordance with the WA OWRP, specifically vessels used in hazing/pre-emptive capture will approach fauna at slow speeds to ensure animals are not directed towards the oil and deterrence/hazing and pre-emptive capture will only be conducted if Woodside has licensed authority from DBCA and approval from the Incident Controller.

### 5.3.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Modelling predicts no shoreline impact from floating hydrocarbons >10 g/m$^2$
- No shoreline accumulation >100 g/m$^2$ threshold is expected.
- The offshore location of the release site is expected to initially result in low numbers of at-risk or impacted wildlife.
- Given there is no potential shoreline accumulation >100 g/m$^2$ and surface concentrations above 10g/m$^2$ are predicted to be limited to ~52 km from the release location, it is estimated that the oiled wildlife response would be between Level two and four, as defined in the WA OWRP (**Table 5-7**).

**Table 5-5: Key at-risk species potentially in Protection Areas and open ocean**

| Species | Gascoyne AMP | Open ocean |
|---|---|---|
| Marine turtles<br>(including foraging and inter-nesting areas and significant nesting beaches) | √ | √ |
| Whale sharks (migration to and from waters at Ningaloo) | √ | √ |
| Seabirds and/or migratory shorebirds | √ | √ |
| Cetaceans – migratory whales | √ | √ |
| Cetaceans – dolphins and porpoises | √ | √ |
| Sea snakes | √ | √ |

The oiled wildlife response technique targets key wildlife populations at risk within Commonwealth open waters and the nearshore waters. Responding to oiled wildlife consists of eight key stages, as described in **Table 5-6** below.

**Table 5-6: Oiled wildlife response stages**

| Stage | Description |
|---|---|
| Stage 1: Wildlife first strike response | Gather situational awareness including potential wildlife assets at risk. |
| Stage 2: Mobilisation of wildlife resources | Resources include personnel, equipment and facilities. |
| Stage 3: Wildlife reconnaissance | Reconnaissance to identify potentially affected animals. |
| Stage 4: IAP wildlife sub-plan development | The IAP includes the appropriate response options for oiled wildlife, including wildlife priorities for protection from oiling; deterrence measures (see below); and recovery and treatment of oiled wildlife; resourcing of equipment and personnel.<br>It includes consideration of deterrence practices such as 'hazing' to prevent fauna from entering areas potentially contaminated by spilled hydrocarbons, as well as dispersing, displacing or relocating fauna to minimise/prevent contact and provide time for clean-up. |
| Stage 5: Wildlife rescue and staging | This includes the different roles of finding oiled wildlife, capturing wildlife, and holding and/or transportation of wildlife to oiled wildlife facilities. |
| Stage 6: Establishment of an oiled wildlife facility | Treatment facilities would be required for the first-aid, cleaning and rehabilitation of affected animals.<br>A vessel-based 'on-water' facility would likely need to be established to enable stabilisation of oiled wildlife before transport to a suitable treatment facility.<br>Suitable staging sites in Exmouth and Onslow have been identified in the draft Regional Oiled Wildlife Response Operational Plan (OWROP), should a land-based site be required. |
| Stage 7: Wildlife rehabilitation | Considerations include a suitable rehabilitation centre and personnel, wildlife housing, record keeping and success tracking. |
| Stage 8: Oiled wildlife response termination | Once a decision has been made to terminate operations, the Incident Controller will stand down individual participating and supporting agencies. |

Reconnaissance and primary response would be done during operational monitoring and surveillance activities. Where marine fauna is observed on water or transiting near or within the spill area, observations would be recorded through surveillance records.

Staging sites would be established as forward bases for shoreline- or vessel-based field teams. Once recovered to a staging site, wildlife would be transported to the designated oiled wildlife facility or a temporary holding centre (before being transported to the oiled wildlife facility). Temporary holding centres are required when there is significant distance between a staging site and the oiled wildlife facility, to enable stabilisation of oiled animals. The oiled wildlife facility is the primary location where animals would be housed and treated. Sites proposed for staging a regional oiled wildlife response in Exmouth and Onslow have been identified.

To deploy a response that is appropriate to the nature and scale of the event, as well as scalable over time, Woodside would implement an oiled wildlife response in consultation with DBCA and use the capability outlined in the WA OWRP, with additional capability if required (e.g. volunteers) accessible through Woodside's *People & Global Capability Surge Labour Requirement Plan*.

The WA OWRP provides indicative oiled wildlife response levels (**Table 5-7**) and the resources likely to be needed at each increasing level of response.

**Table 5-7: Indicative oiled wildlife response (OWR) level (adapted from the WA OWRP, 2014)**

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

### 5.4.1 Environmental performance based on need

**Table 5-8: Environmental Performance – Oiled Wildlife Response**

| **Environmental Performance Outcome** | | Oiled Wildlife Response is conducted in accordance with the Western Australian Oiled Wildlife Response Plan (WA OWRP) to ensure it is conducted in accordance with legislative requirements to house, release or euthanise fauna under the Animal Welfare Act 2002. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 12 | Wildlife response equipment | 12.1 | Contracted capability to treat 100 individual fauna for immediate mobilisation to RPAs | 1, 3A, 3B, 3C, 4 |
| | | 12.2 | Contracted capability to treat up to an additional 250 individual fauna within a five-day period. | |
| | | 12.3 | National plan access to additional resources under the guidance of the DoT (up to a Level 5 oiled wildlife response as specified in the OWRP), with the ability to treat about 600 individual fauna by the time hydrocarbons contact the shoreline. | 1, 3C, 4 |
| | | 12.4 | Vessels used in hazing/pre-emptive capture will approach fauna at slow speeds to ensure animals are not directed towards the hydrocarbons. | 1, 3A, 3B, 4 |
| | | 12.5 | Facilities for the rehabilitation of oiled wildlife are operational 24/7 as per WA OWRP. | 1, 3A, 4 |
| 13 | Wildlife responders | 13.1 | 3 wildlife divisional commanders to lead the oiled wildlife operations who have completed an Oiled Wildlife Response Management course | 1, 2, 3B |
| | | 13.2 | Wildlife responders to be accessed through resource pool and additional agreements with specialist providers | 1, 2, 3A, 3B, 3C, 4 |
| | | 13.3 | Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA. | 1 |
| | | 13.4 | Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s) | 1, 3A, 3B |
| 14 | Management of environmental impact of the response risks | 14.1 | If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified. | 1 |
| | | 14.2 | Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines | |

The resulting wildlife response capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to response at identified RPAs.

Under optimal conditions, during the surface release the capability available meets the need identified. It indicates that, the wildlife response capability has the following expected performance:

- Mobilisation and deployment of one central wildlife treatment and rehabilitation locations at Exmouth and Onslow in accordance with WA OWRP.
- No additional capability will be required for this activity, given the oiled wildlife response will be limited to open water.
- Recovered wildlife from open water would be transported to a central treatment location at Exmouth or Onslow.

## 5.5 Waste Management

Waste management is considered a support technique to oiled wildlife response, containment and recovery and shoreline clean-up. For the purposes of this OSPRMA, waste management may be required to support wildlife response. Waste generated and collected during the response that will require handling, management and disposal may consist of:

- Liquids (hydrocarbons and contaminated liquids) collected during wildlife response, and/or
- Solids/semi-solids (oily solids, garbage, contaminated materials) and debris collected during wildlife response.

Expected waste volumes during an event are likely to vary depending on oil type, volume released, response techniques employed and extent of weathering of hydrocarbons. Waste management, handling and capacity should be scalable to ensure continuous response operations can be maintained.

All waste management activities will follow the Environment Protection (Controlled Waste) Regulations 2004 and the waste will be managed to minimise final disposal volumes. Waste treatment techniques will consider contaminated solids treatment to allow disposal to landfill and solids with high concentrations of hydrocarbon will be treated and recycled where possible or used in clean fill if suitable.

The waste products would be transported from response locations to the nearest suitable staging area/waste transfer station for treatment, disposal or recycling. Waste will be transferred with appropriately licensed vehicles. Containers will be available for temporary waste storage and will be:

- labelled with the waste type
- provided with appropriate lids to prevent waste being blown overboard
- bunded if storing liquid wastes.
- processes will be in place for transfers of bulk liquid wastes and include:
  - inspection of transfer hose undertaken prior to transfer
  - watchman equipped with radio visually monitors loading hose during transfer
  - tank gauges monitored throughout operation to prevent overflow

The *Oil Spill Preparedness Waste Management Support Plan* details the procedures, capability and capacity in place between Woodside and its primary waste services contractor (Veolia Waste Management) to manage waste volumes generated from response activities.

### 5.5.1 Response Need Based on Predicted Consequence Parameters

**Table 5-9: Response Planning Assumptions – Waste Management**

| Response planning assumptions: Waste management | |
|---|---|
| **Waste loading per $m^3$ oil recovered (multiplier)** | Oiled wildlife response – approx. 1 $m^3$ of oily liquid waste generated for each wildlife unit cleaned |

### 5.5.2 Environmental Performance Based on Need

**Table 5-10: Environmental Performance – Waste Management**

| **Environmental Performance Outcome** | | To minimise further impacts, waste will be managed, tracked and disposed of in accordance with laws and regulations. | | |
|---|---|---|---|---|
| **Control Measure** | | **Performance Standard** | | **Measurement Criteria** |
| 15 | Waste Management | 15.1 | Contract with waste management services for transport, removal, treatment and disposal of waste | 1, 3A, 3B, 3C, 4 |
| | | 15.2 | Access to at least 50 $m^3$ of solid and liquid waste storage available within 1 week upon activation of 3rd party contract. | |
| | | 15.3 | Recovered hydrocarbons and wastes will be transferred to licensed treatment facility for reprocessing or disposal. | |
| | | 15.4 | Response teams will segregate liquid and solid wastes at the earliest opportunity. | |
| | | 15.5 | Waste management provider support staff available year-round to assist in the event of an incident with waste management as detailed in contract. | |
| | | 15.6 | Open communication line to be maintained between IMT and waste management services to ensure the reliable flow of accurate information between parties. | 1, 3A, 3B |
| | | 15.7 | Waste management to be conducted in accordance with Australian laws and regulations | 1, 3A, 3B, 3C, 4 |
| | | 15.8 | Waste management services available and employed during response | |

The resulting waste management capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to waste management from oiled wildlife response.

It indicates that the waste management capability has the following expected performance:

- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures.
- The waste management requirements of all credible spill scenarios are well within Woodside's and its service providers existing capacity.
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the requirements of this technique does not justify the excessive costs of identified alternate, improved or additional controls.

## 5.6 Scientific monitoring

A scientific monitoring program (SMP) would be activated following a level two or three unplanned oil spill, or any release event with the potential to contact sensitive environmental receptors. This would consider receptors at risk (ecological and socio-economic) for the entire predicted Environment that Maybe Affected (EMBA) and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the credible spill scenarios or other identified unplanned hydrocarbon releases associated with the operational activities (refer to Table 2-5: PAP worse case credible spill scenarios).

The outputs of the stochastic hydrocarbon spill modelling were used to assess the environmental risk of the hydrocarbon affected area as delineated by the ecological impact EMBA and social-cultural EMBA based on exceedance of environmental and social-cultural hydrocarbon threshold concentrations (refer to **Table 2-2** and see Section 6 of the EP for further information on applicable thresholds and the EMBAs). The PAP worst-case credible spill CS-01: marine diesel release defines the EMBA and are the basis of the SMP approach presented in this section. The dry gas release (CS-03) would not result in the activation of a Scarborough SMP.

It should be noted that the resulting SMP receptor locations differ from the Response Protection Areas (RPAs) discussed in **Section 3** of this document due to the applicability of different hydrocarbon threshold levels. The SMP would be informed by the data collected via the operational monitoring program (OMP) studies, however, it differs from the OMP in being a long-term program independent of, and not directing, the operational oil spill response or monitoring of impacts from response activities (refer to **Section 5.1**, Monitor and Evaluate) for the operational monitoring overview.

Key objectives of the Woodside oil spill SMP are:

- Assess the extent, severity and persistence of the environmental impacts from the spill event; and
- Monitor subsequent recovery of impacted key species, habitats and ecosystems.

The SMP comprises ten targeted environmental monitoring programs to assess the condition of a range of physico-chemical (water and sediment) and biological (species and habitats) receptors including Environment Protection and Biodiversity Conservation Act (EPBC Act 1999) listed species, environmental values associated with protected areas and socio-economic values, such as fisheries. The ten SMPs are as follows:

- SM01 - Assessment of the presence, quantity and character of hydrocarbons in marine waters (linked to OM01 to OM03)
- SM02 - Assessment of the presence, quantity and character of hydrocarbons in marine sediments (linked to OM01 and OM05)
- SM03 – Assessment of impacts and recovery of subtidal and intertidal benthos
- SM04 - Assessment of impacts and recovery of mangroves/saltmarsh habitat
- SM05 - Assessment of impacts and recovery of seabird and shorebird populations
- SM06 - Assessment of impacts and recovery of nesting marine turtle populations
- SM07 - Assessment of impacts to pinniped colonies including haul-out site populations
- SM08 - Desktop assessment of impacts to other non-avian marine megafauna
- SM09 - Assessment of impacts and recovery of marine fish (linked to SM03)
- SM10 - Assessment of physiological impacts to important fish and shellfish species (fish health and seafood quality/safety) and recovery.

These SMPs have been designed to cover all key tropical and temperate habitats and species within Australian waters and broader, if required. A planning area for scientific monitoring is also identified to acknowledge potential hydrocarbon contact below the environmental threshold concentrations and beyond the EMBA. This planning area has been set with reference to the entrained low exposure value of 10 ppb detailed in the NOPSEMA Bulletin #1 Oil Spill Modelling (2019), as shown in **Figure 5-1**.

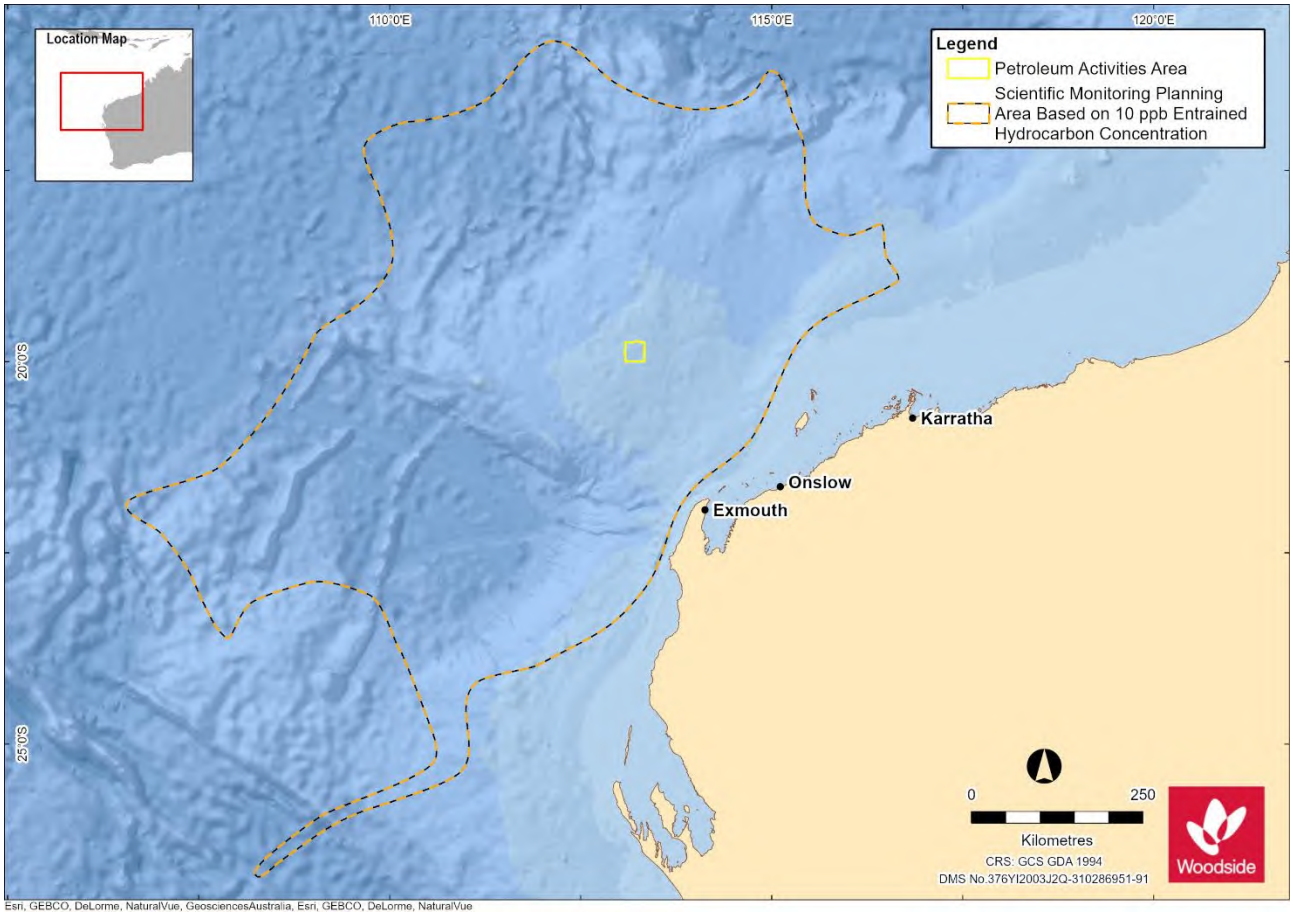


**Figure 5-1:The planning area for scientific monitoring based on the area potentially contacted by the low exposure (below ecological impact) entrained hydrocarbon concentration of 10 ppb in the event of the worst-case credible spill scenario (CS-01: marine diesel release).**

NOTE: Figure 5-1 represents the overall combined extent of the marine diesel spill model outputs based on a total of 200 replicate simulations over an annual period for the worst case credible scenario (CS-01) and therefore represents the largest spatial boundaries of the hydrocarbon spill combinations, not the spatial extent of a single hydrocarbon spill.

### 5.6.1 Scientific Monitoring Deployment Considerations

**Table 5-11: Scientific monitoring deployment considerations**

| Scientific Monitoring Deployment Considerations | |
|---|---|
| Existing baseline studies for sensitive receptor locations predicted to be affected by a spill | PBAs of the following two categories:<br>• PBAs within the predicted <10-day hydrocarbon contact time prediction: As part of this assessment, the approach was to conduct a desktop review of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted within ten days of a spill (based on the EMBA). Then investigate the need to conduct baseline data collection to address data gaps and demonstrate spill response preparedness (refer to ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program). In the scenario, that baseline data needs are identified, planning for baseline data acquisition is typically commenced pre-PAP and execution of studies undertaken with consideration of weather, receptor type, seasonality and temporal assessment requirements.<br>• PBAs >10 days' time to predicted hydrocarbon contact in the event of an unplanned hydrocarbon release (from the Scarborough Drilling and Completions operational activities). As part of this assessment, a desktop review is conducted of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted >10 days' time of a hydrocarbon spill event and documented (refer to Section 5.5.2). SMP activation (as per the Scarborough Drillings and Completions FSP) directs the SMP team to follow the steps outlined in the SMP Operational Plan. The steps include: checking the availability and type of existing baseline data, with particular reference to any PBAs identified as >10 days to hydrocarbon contact. Such information is used to identify response phase PBAs and plan for the activation of SMPs for pre-emptive (i.e. pre-hydrocarbon contact) baseline assessment. |
| Pre-emptive Baseline in the event of a spill | Activation of SMPs in order to collect baseline data at sensitive receptor locations with predicted hydrocarbon contact time >10 days (as documented in ANNEX C). |
| Survey platform suitability and availability | In the event of the SMP activation, suitable survey platforms are available and can support the range of equipment and data collection methodologies to be implemented in nearshore and offshore marine environments. |
| Trained personnel to implement SMPs suitable and available. | Access to trained personnel and the sampling equipment contracted for scientific monitoring via a dedicated scientific monitoring program standby contract. |
| Met-ocean conditions | The following met-ocean conditions have been identified to implement SMPs:<br>• Waves <1 m for nearshore systems<br>• Waves <1.5 m for offshore systems<br>• Winds <20 knots<br>• Daylight operations only<br>SMP implementation will be planned and managed according to HSE risk reviews and the met-ocean conditions on a day to day basis by SMP operations. |

### 5.6.2 Response planning assumptions

**Table 5-12: Scientific monitoring response planning assumptions**

| Response Planning Assumptions | |
|---|---|
| PBAs | PBAs identified through the application of defined hydrocarbon impact thresholds during the Quantitative Spill Risk Assessment process and a consideration of the minimum time to contact at receptor locations fall into two categories:<br>• PBAs (≤ 10 days minimum time to contact) for which baseline data are planned for and data collection may commence pre-PAP, where identified as a gap.<br>• PBAs (> 10 days minimum time to contact) for which baseline data may be collected in the event of an unplanned hydrocarbon release. Response phase PBAs are prioritised for SMP |

| | |
|---|---|
| | activities due to vulnerability (i.e. time to contact and environmental sensitivity) to potential impacts from hydrocarbon contact and an identified need to acquire baseline data.<br><br>Time to hydrocarbon contact of >10 days has been identified as a minimum timeframe within which it is feasible to plan and mobilise applicable SMPs and commence collection of baseline (pre-hydrocarbon contact) data, in the event of an unplanned hydrocarbon release from the Scarborough Drillings and Completions Operations.<br><br>PBAs for Scarborough Drillings and Completions Operations identified and listed in ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program, Table D-1. The PBAs together with the situational awareness (from the operational monitoring) are the basis for the response phase SMP planning and implementation. |
| Pre-spill | A review of existing baseline data for receptor locations with potential to be contacted by entrained hydrocarbons at the environmental threshold within ≤10 days has identified the offshore open waters of the Commonwealth Marine Environment (MNES) but no submerged or shoreline sensitive receivers contacted by the hydrocarbon release.<br><br>Australian Marine Parks (AMPs) potentially affected includes:<br><br>• Gascoyne AMP<br><br>All the Australian Marine Parks (AMPs) are located in offshore waters where hydrocarbon exposure is possible on surface waters and in the upper layers of the water column. |
| In the event of a spill | Locations with >10 days to hydrocarbon contact, as well as the wider area, will be investigated and identified by the SMP team (in the Environment Unit of the Corporate Incident Management Team (CIMT)) as the spill event unfolds and as the situational awareness provided by the OMPs permits delineation of the spill affected area (for example, updates to the spill trajectory tracking). Based on the PAP worst case credible spill CS-01 (Table 2-5), the hydrocarbon spill affected area remains offshore (within the Commonwealth Marine Environment) with expanding hydrocarbon exposure in the upper water column of the Gascoyne AMP.<br><br>In the event key receptors within geographic locations that are potentially impacted after 10 days following a spill event or commencement of the spill, and where adequate and appropriate baseline data are not available, there will be a response phase effort to collect baseline data for the following purposes:<br><br>• Priority will be given to the collection of baseline data for receptors predicted to be within the spill affected area prior to hydrocarbon contact. The process is initiated with the investigation of available baseline and time to hydrocarbon contact (>10 days which is sufficient time to mobilise SMP teams and acquire data before hydrocarbon contact).<br>• Highly sensitive and/or valued habitats and communities in coastal waters will be prioritised for pre-emptive baseline surveys over open water areas of AMPs.<br><br>Collect baseline data for receptors predicted to be outside the spill affected area so reference datasets for comparative analysis with impacted receptor types can be assessed post-spill. |
| Baseline Data | A summary of the spill affected area and receptor locations as defined by the EMBA for the PAP worst case credible spill CS-01 (Table 2-5), is presented in the Scarborough Drillings and Completions EP (refer to Section 6 of the EP).<br><br>The key receptors at risk by location and corresponding SMPs based on the EMBA for the PAP are presented in ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program, as per the PAP worse case credible spill scenario. This matrix maps the receptors at risk with their location and the applicable SMPs that may be triggered in the event of a Level two or three hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. Receptor locations and applicable SMPs are colour coded to highlight possible time to contact based on receptor locations identified as PBAs.<br><br>The status of baseline studies relevant to the PAP are tracked by Woodside through the maintenance of a Corporate Environment Environmental Baseline Database (managed by the Woodside Environmental Science team), as well as accessing external databases such as the Department of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA)[3] (refer to ANNEX C: Oil Spill Scientific monitoring Program). |

[3] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

### 5.6.3 Summary – scientific monitoring

The resulting scientific monitoring capability has been assessed against the PAP worst case credible spill scenarios. The range of strategies provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts. All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be moderate and the overall delivery effectiveness determined to be medium. The SMP's main objectives can be met, with no additional, alternative or improved control measures providing further benefit.

### 5.6.4 Response planning: need, capability and gap – scientific monitoring

The receptor locations identified in **ANNEX D**: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program provide the basis of the SMPs likely to be selected and activated. Once the Woodside SMP Delivery team and Standby SMP contractor have been stood up and the exact nature and scale of the spill becomes known, the SMPs to be activated will be confirmed as per the process set out in the SMP Operational Plan.

**Scope of SMP Operations in the event of a hydrocarbon spill**

Receptor locations of interest for the SMP during the response phase are:

- Gascoyne AMP

The SMP approach in the response phase would still deploy SMP teams to maximise the opportunity to collect pre-emptive baseline data at sensitive receptor locations, not immediately contacted by hydrocarbons. As the exact locations where hydrocarbon contact occurs may be unpredictable, SM01 would be mobilised as a priority to be able to detect hydrocarbons and track the leading edge of the spill to verify where hydrocarbon contact occurs which will assist with where SMP resources are a priority need to obtain pre-emptive baseline data.

The option analysis in **Section 6.6** considers ways to reduce the gap by considering alternate, additional, and/or improved control measures on each selected response strategy.

### 5.6.5 Environmental performance based on need

**Table 5-13: Environment Performance – Scientific Monitoring**

| **Environmental Performance Outcome** | | Woodside can demonstrate preparedness to stand up the SMP to quantitatively assess and report on the extent, severity, persistence and recovery of sensitive receptors impacted from the spill event. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 16 | • Woodside has an established and dedicated SMP team comprising the Environmental Science Team and additional Environment Advisers within the Health, Safety Environment (HSE) Function. | 16.1 | SMP team comprises a pool of competent Environment Advisers (stand up personnel) who receive training regarding the SMP, SMP activation and implementation of the SMP on an annual basis. | • Training materials.<br>• Training attendance registers.<br>Process that maps minimum qualification and experience with key SMP role competency and a tracker to manage availability of competent people for the SMP team including redundancy and rostering. |
| 17 | • Woodside has contracted SMP service provider to provide scientific personnel to resource a base capability of one team per SMP (SM01-SM10, see ANNEX C: Oil Spill Scientific monitoring Program Table C-2) as detailed in Woodside's SMP standby contractor Implementation Plan, to implement the oil spill scientific monitoring programs. The availability of relevant personnel is reported to Woodside on a monthly basis via a simple report on the base-loading availability of people for each of the SMPs comprising field work for data collection (SMP resourcing report register).<br>• In the event of a spill and the SMP is activated, the base-loading availability of scientific personnel will be provided by SMP standby contractor for the individual SMPs and where gaps in resources are identified, SMP standby contractor/Woodside will seek additional personnel (if needed) from other sources including Woodside's Environmental Services Panel. | 17.1 | Woodside maintains the capability to mobilise personnel required to conduct scientific monitoring programs SM01 – SM10 (except desktop based SM08):<br>• Personnel are sourced through the existing standby contract with SMP standby contractor, as detailed within the SMP Implementation Plan.<br>• Scientific Monitoring Program Implementation Plan describes the process for standing up and implementing the scientific monitoring programs.<br>• SMP team stand up personnel receive training regarding the stand up, activation and implementation of the SMP on an annual basis. | • Hydrocarbon Spill Preparedness Team Internal Control Environment tracks the quarterly review of the Oil Spill Contracts Master.<br>• SMP resource report of personnel availability provided by SMP contractor on monthly basis (SMP resourcing report register.<br>• Training materials.<br>• Training attendance registers.<br>• Competency criteria for SMP roles.<br>• SMP annual arrangement testing and reporting. |
| 18 | • Roles and responsibilities for SMP implementation are captured in Table C-1 (ANNEX C) and the SMP team (as per the organisational structure of the CIMT) is outlined in SMP Operational Plan. Woodside has a defined Crisis and Incident Management structure including Source Control, Operations, Planning and Logistics functions to manage a loss of well containment response. | 18.1 | • Woodside has established an SMP organisational structure and processes to stand up and deliver the SMP. | • SMP Oil Spill Scientific Monitoring Operational Plan.<br>• SMP Implementation Plan. |

| | | | | |
|---|---|---|---|---|
| | • SMP Team structure, interface with SMP standby contractor and linkage to the CIMT is presented in Figure C-1, ANNEX C.<br>• Woodside has a defined Command, Control and Coordination structure for Incident and Emergency Management that is based on the AIIMS framework utilised in Australia.<br>• Woodside utilises an online Incident Management System (IMS) to coordinate and track key incident management functions. This includes specialist modelling programs, geographic information systems (GIS), as well as communication flows within the Command, Control and Coordination structure.<br>• SMP activated via the FSP.<br>• Step by step process to activation of individual SMPs provided in the SMP Operational Plan.<br>• All decisions made regarding SMP logged in the online IMS (SMP team members trained in using Woodside's online Incident Management System).<br>• SMP component input to the CIMT IAP as per the identified CIMT timed sessions and the SMP IAP logged on the online IMS.<br>• Woodside Environmental Science Team provides awareness training on the activation and stand-up of the Scientific Monitoring Programme (SMP) for the Environment Advisers in Woodside who are listed on the SMP team on an annual basis.<br>• Woodside Environmental Science Team provides awareness training on the activation and stand-up of the Scientific Monitoring Program (SMP) for the SMP Standby provider on an annual basis.<br>• Woodside Environmental Science Team co-ordinates an annual SMP arrangement testing exercise performed by the SMP standby contractor. SMP standby contractor and the SMP arrangements (people and equipment availability) tested annually since 2016. | | | • SMP annual arrangement testing and reporting. |
| 19 | • Chartered and mutual aid vessels.<br>• Suitable vessels would be secured from the Woodside support vessels, regional fleet of vessels operated by Woodside and other operators and the regional charter market.<br>• Vessel suitability will be guided by the need to be equipped to operate grab samplers, drop camera systems and water sampling equipment (the individual vessel requirements are outlined in the relevant SMP methodologies (refer to Table C-2, ANNEX C).<br>• Nearshore mainland waters could use the same approach as for open water. Smaller vessels may be used where available and appropriate. Suitable vehicles and machinery for onshore access to nearshore SMP locations would be provided by Woodside's transport services contract and sourced from the wider market. | 19.1 | Woodside maintains standby SMP capability to mobilise equipment required to conduct scientific monitoring programs SM01 – SM10 (except desktop based SM08):<br>• Equipment is sourced through the existing standby contract with Standby SMP standby contractor, as detailed within the SMP Implementation Plan. | • Hydrocarbon Spill Preparedness Team Internal Control Environment tracks the quarterly review of the Oil Spill Contracts Master.<br>• SMP standby monthly resource reports of equipment availability provided by SMP contractor (SMP resourcing report register).<br>• SMP annual arrangement testing and reporting. |

| | | | | |
|---|---|---|---|---|
| | • Dedicated survey equipment requirements for scientific monitoring range from remote towed video and drop camera systems to capture seabed images of benthic communities to intertidal/onshore surveying tools such as quadrats, theodolites and spades/trowels, cameras and binoculars (specific survey equipment requirements are outlined in the relevant SMP methodologies (refer to Table C-2, ANNEX C)). Equipment would be sourced through the existing SMP standby contract with Standby SMP contractor for SMP resources and if additional surge capacity is required this would be available through the other Woodside Environmental Services Panel Contractors and specialist contractors. Standby SMP contractor can also address equipment redundancy through either individual or multiple suppliers. MoUs are in place with marine sampling equipment suppliers and analytical laboratories (SMP resourcing report register).<br>• Availability of SMP equipment for offshore/onshore scientific monitoring team mobilisation is within one week to ten days of the commencement of a hydrocarbon release. This meets the SMP mobilisation lead time that will support meeting the response objective of 'acquire, where practicable, the environmental baseline data prior to hydrocarbon contact required to support the post-response SMP. | | | |
| 20 | Woodside's SMP approach addresses the pre-PAP acquisition of baseline data for PBAs with ≤10 days if required following a baseline gap analysis process.<br><br>Woodside maintains knowledge of Environmental Baseline data through:<br><br>• Documentation annual reviews of the Woodside Baseline Environmental Studies Database, and specific activity baseline gap analyses.<br>• Accessing external databases such as the Department of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA)[4] (refer to ANNEX C: Oil Spill Scientific monitoring Program). | 20.1 | • Annual reviews of environmental baseline data.<br>• PAP specific Pre-emptive Baseline Area baseline gap analysis. | • Annual review/update of Woodside Baseline Environmental Studies Database.<br>• Desktop review to assess the environmental baseline study gaps completed prior to EP submission.<br>• Accessing baseline knowledge via the SMP annual arrangement testing. |

[4] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

| **Environmental Performance Outcome** | | SMP plan to acquire response phase monitoring targeting pre-emptive data achieved. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 21 | Woodside's SMP approach addresses:<br>• Scientific data acquisition for PBAs >10 days to hydrocarbon contact and activated in the response phase and<br>• Transition into post-response SMP monitoring. | 21.1 | **PBA baseline data acquisition in the response phase**<br>If baseline data gaps are identified for PBAs that has predicted hydrocarbon contact (contact time >10 days), there will be a response phase effort to collect baseline data with priority in implementing SMPs given to receptors where pre-emptive baseline data can be acquired or improved.<br>SMP team (within the Environment Unit of the CIMT) contribute SMP component of the CIMT Planning Function in development of the IAP. | • Response SMP plan.<br>• Woodside's online Incident Management System Records.<br>• SMP component of the Incident Action Plan (IAPs). |
| | | 21.2 | **Post Spill contact**<br>For the receptors contacted by the spill in where baseline data are available, SMPs programs to assess and monitor receptor condition will be implemented post spill (i.e. after the response phase). | • SMP planning document.<br>• SMP Decision Log.<br>• IAPs. |

| **Environmental Performance Outcome** | | Implementation of the SMP (response and post-response phases). | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 22 | • Scientific monitoring will address quantitative assessment of environmental impacts of a level two or three spill or any release event with the potential to contact sensitive environmental receptors. The SMP comprises ten targeted environmental monitoring programs.<br>• SMP supporting documentation: (1) Oil Spill Scientific Monitoring Operational Plan; (2) SMP Implementation Plan and (3) SMP Process and Methodologies Guideline.<br>• The Oil Spill Scientific Monitoring Operational Plan details the process of SMP selection, input to the Incident Action Plan (IAP) to trigger operational logistic support services. Methodology documents for each of the ten SMPs are accessible detailing equipment, data collection techniques and the specifications required for the survey platform support.<br>• The SMP standby contractor holds a Woodside SMP implementation plan detailing activation processes, linkage with the Woodside SMP team and the general principles for the planning and mobilisation of SMPs to deliver the individual SMPs activated. Monthly resourcing report are issued by the SMP standby contractor (SMP resourcing report register). All SMP documents and their status are tracked via SMP document register. | 22.1 | **Implementation of SM01**<br>SM01 will be implemented to assess the presence, quantity and character of hydrocarbons in marine waters during the spill event in nearshore areas. | Evidence SM01 has been triggered:<br>• Documentation as per requirements of the SMP Operational Plan.<br>• Woodside's online Incident Management System Records.<br>• SMP component of the IAP.<br>• SMP data records from field. |
| | | 22.2 | **Implementation of SM02-SM10**<br>SM02-SM10 will be implemented in accordance with the objectives and activation triggers as per Table C-2 of ANNEX C. | Evidence SMPs have been triggered:<br>• Documentation as per requirements of the SMP Operational Plan.<br>• Woodside's online Incident Management System Records.<br>• SMP component of the IAP.<br>• SMP data records from field. |
| | | 22.3 | **Termination of SMP plans**<br>The Scientific Monitoring Program will be terminated in accordance with termination triggers for the SMP's detailed in Table C-2 of ANNEX C, and the Termination Criteria Decision-tree for Oil Spill Environmental Monitoring (Figure C-3 of ANNEX C): | Evidence of Termination Criteria triggered:<br>• Documentation and approval by relevant persons/ organisations to end SMPs for specific receptor types. |

## 5.7 Incident Management System (IMS)

The IMS is both a control measure and a measurement criterion. As a control measure the IMS function is to prompt, facilitate and record the completion of three key response planning processes detailed below. As a measurement criterion the IMS records the evidence of the timeliness of all response actions included in the environmental performance standards and the plans used of the PAP. As the IMS does not directly remove hydrocarbons spilt into the marine environment there is no direct relationship to the response planning need.

### 5.7.1 Incident action planning

The CIMT will be required to collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an IAP and assist the IMT with the execution of that plan. The site-based incident controller (IC) may request the CIMT to complete notifications internally within Woodside, to relevant persons/ organisations and government agencies as required. Depending on the type and scale of the incident either the CIMT Duty Manager (DM) or IC will be responsible for ensuring the development of the IAP. Incident Action Planning is an ongoing process that involves continual review to ensure techniques to control the incident are appropriate to the situation at the time.

### 5.7.2 Operational NEBA process

In the event of a response Woodside will confirm that the response techniques adopted at the time of Environment Plan/Oil Pollution Emergency Plan (EP/OPEP) acceptance remain appropriate to reduce the consequences of the spill. This process verifies that there is a continuing net environmental benefit associated with continuing the response technique through the operational NEBA process. This process manages the environmental risks and impacts of response techniques during the spill response, an operational NEBA will be undertaken throughout the response, for each operational period.

The operational NEBA will consider the risks and benefits of conducting and response activity. For example, if vessels are required for access to nearshore or onshore areas, anchoring locations will be selected to minimise disturbance to benthic habitats. Vessel cleanliness would be commensurate with the receiving environment. The operational NEBA will consider the risks and benefits of conducting other response techniques.

The operational NEBA process is also used to terminate a response. Using data from operational and scientific monitoring activities the response to a hydrocarbon spill will be terminated in accordance with the termination process outlined in the Oil Pollution Emergency Arrangements (Australia). In effect the operational NEBA will determine whether there is net environmental benefit to continue response operations.

### 5.7.3 Consultation engagement process

Woodside will ensure relevant persons/ organisations are engaged during the spill response in accordance with internal standards as outlined in **Table 5-14**. This process requires that Woodside will:

- Undertake all required notifications (including government notifications) for relevant persons/ organisations in the region (identified in the First Strike Plan). This includes notification to mariners to communicate navigational hazards introduced through response equipment and personnel.
- In the event of a response, identify and engage with relevant persons/ organisations and continually assess and review.

### 5.7.4 Environmental performance based on need

**Table 5-14: Environmental Performance – Incident Management System**

| **Environmental Performance Outcome** | | To support the effectiveness of all other control measures and monitor/record the performance levels achieved. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 23 | Operational NEBA | 23.1 | Confirm that the response techniques adopted at the time of acceptance remain appropriate to reduce the consequences of the spill within 24 hours. | 1, 3A |
| | | 23.2 | Record the evidence and justification for any deviation from the planned response activities. | |
| | | 23.3 | Record the information and data from operational and scientific monitoring activities used to inform the NEBA. | |
| 24 | Stakeholder engagement | 24.1 | Prompt and record all notifications (including government notifications) for elevant persons/ organisations in the region are made | |
| | | 24.2 | In the event of a response, identification of relevant persons/ organisations will be re-assessed throughout the response period. | |
| | | 24.3 | Undertake communications in accordance with:<br>Woodside Crisis Management Functional Support Team Guideline – Reputation<br>External Communication and Continuous Disclosure Procedure<br>External Stakeholder Engagement Procedure | |
| 25 | Personnel required to support any response | 25.1 | Action planning is an ongoing process that involves continual review to ensure techniques to control the incident are appropriate to the situation at the time. | 1, 3B |
| | | 25.2 | A duty roster of trained and competent people will be maintained to ensure that minimum manning requirements are met all year round. | 3C |
| | | 25.3 | Immediately activate the IMT with personnel filling one or more of the following roles:<br>• Operations Duty Manager;<br>• Operations Coordinator;<br>• Deputy Operations Coordinator;<br>• Planning Coordinator;<br>• Logistics (materials, aviation, marine and support positions);<br>• Management Support;<br>• Health and Safety Advisor;<br>• Environment Duty Manager;<br>• People Coordinator;<br>• Public Information Coordinator;<br>• Intelligence Coordinator; and<br>• Finance Coordinator. | 1, 2, 3B, 3C, 4 |
| | | 25.4 | Collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an IAP and assist with the execution of that plan. | |
| | | 25.5 | Security and emergency management (S&EM) advisors will be integrated into CIMT to monitor performance of all functional roles. | |
| | | 25.6 | Continually communicate the status of the spill and support Woodside to determine the most appropriate response by delivering on the responsibilities of their role. | |
| | | 25.7 | Follow the OPEA, Operational Plans, FSPs, support plans and the IAPs developed. | 1, 2, 3A, 4 |
| | | 25.8 | Contribute to Woodside's response in accordance with the aims and objectives set by the Duty Manager. | 1, 2, 3B, 3C, 4 |

## 5.8 Measurement criteria for all response techniques

Woodside ensures compliance with environmental performance outcomes and standards through four primary mechanisms. The performance tables aforementioned identify which of these four mechanisms monitors the readiness and records the effectiveness and performance of the control measures adopted.'

### *1. The incident management system*

The Incident Management System (IMS) supports the implementation of the Emergency & Crisis Management Procedure. The IMS provides a near real-time, single source of information for monitoring and recording an incident and measuring the performance of those control measures.

The Emergency & Crisis Management Procedure defines the management framework, including roles and responsibilities, to be applied to any size incident (including hydrocarbon spills). The organisational structure required to manage an incident is developed in a modular fashion and is based on the specific requirements of each incident. The structure can be scaled up or down.

IAP process formally documents and communicated the:

- Incident objectives;
- Status of assets;
- Operational period objectives;
- Response techniques (defined during response planning); and
- The effectiveness of response techniques.

The information captured in the IMS (including information from personal logs and assigned tasks/close outs) confirms the response techniques implemented remain appropriate to reduce the consequences of the spill. The system also records all information and data that can be used to support the site-based IMT, development and the execution of the IAP.

### *2. The S&EM competency dashboard*

The Security and Emergency Management (S&EM) competency dashboard records the number of trained and competent responders that are available across Woodside, and some external providers, to participate in a response.

This number varies dependent on expiry of competency certificates, staff attrition, internal rotations, leave and other absences. As such the Dashboard is designed to identify the minimum manning requirements and to identify sufficient redundancy to cater for the variances listed above.

**Figure 5-2** shows the minimum manning numbers for the different hydrocarbon spill response roles and the number of qualified persons against those roles.

Woodside's pool of trained responders is composed of but not limited to personnel from the following organisations:

- Woodside internal
- Australian Marine Oil Spill Centre (AMOSC) core group
- AMOSC
- Oil Spill Response Limited (OSRL)
- Marine Spill Response Corporation (MSRC)
- AMSA
- Woodside contracted workforce

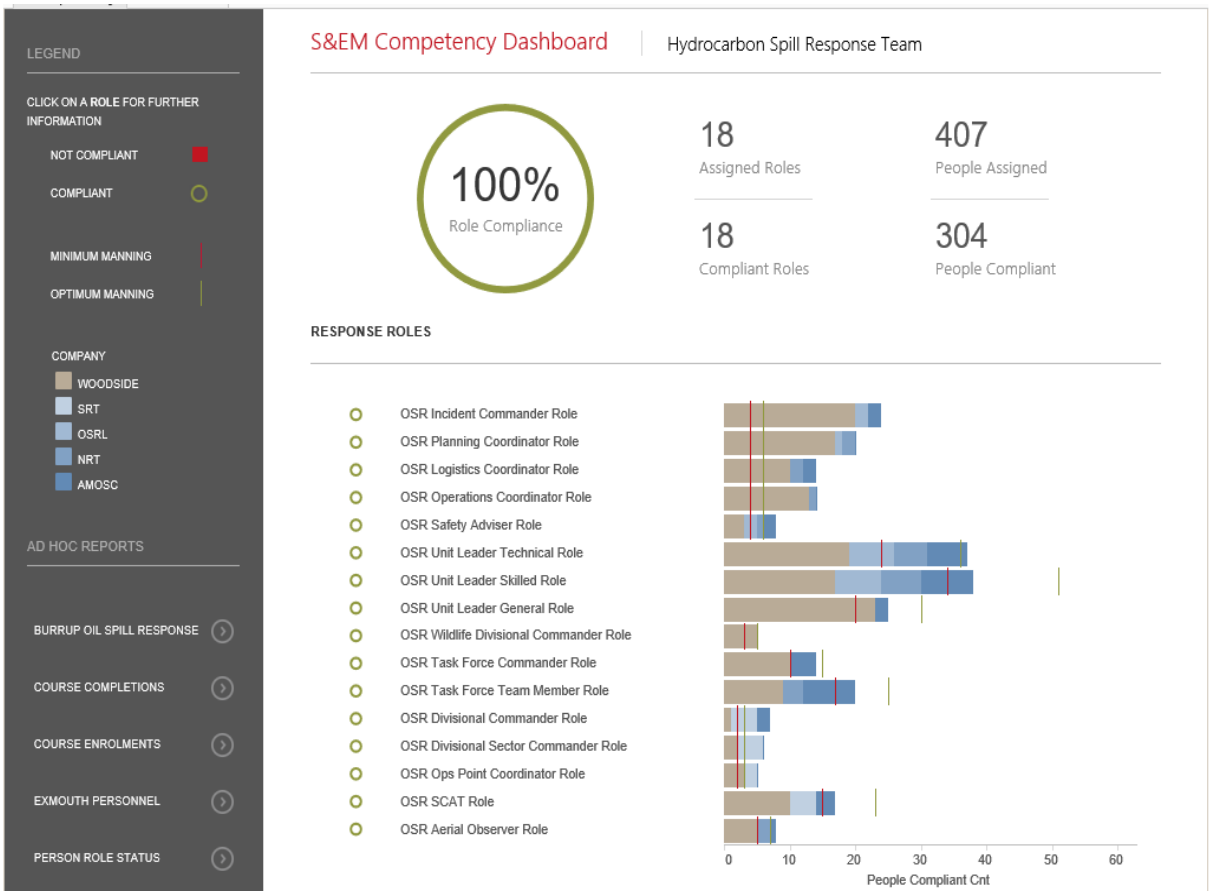


**Figure 5-2: Example screen shot of the hydrocarbon spill preparedness (HSP) competency dashboard**

The Dashboard is one of Woodside's key means of monitoring its readiness to respond. It also and shows that Woodside can meet the requirements of the environmental performance standard that relate to filling certain response roles.

**Figure 5-3** shows deeper dive into the Ops Point Coordinator role and the training modules required to show competence.

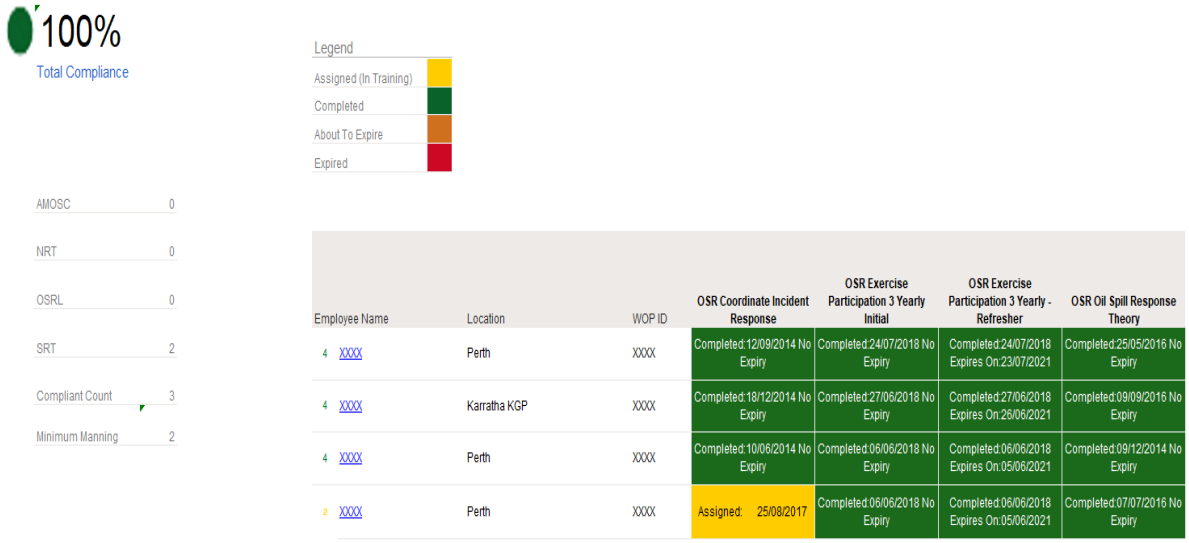


**Figure 5-3: Example screen shot for the Ops Point Coordinator role**

### *3. The hydrocarbon spill Preparedness ICE assurance process*

The Hydrocarbon Spill Response Team has developed a Hydrocarbon Spill Preparedness and Response Internal Control Environment (ICE) process to align and feed into the Woodside Management System Assurance process for hydrocarbon spill. The process tracks compliance over four key control areas:

a) **Plans** – Ensures all plans (including: Oil Pollution Emergency Arrangements, first strike plans, operational plans, support plans and tactical response plans inANNEX E: Tactical Response Plans) are current and in line with regulatory and internal requirements.

b) **Competency** – Ensures the competency dashboard is up to date and there are the minimum competency numbers across CIMT, Crisis Management Team (CMT) and hydrocarbon spill response roles. The hydrocarbon spill training plan and exercise schedule, including testing of arrangements is also tracked. The Testing of Arrangements (TOA) register tracks the testing of all hydrocarbon spill response arrangements, key contracts and agreements in place with internal and external parties to ensure compliance.

c) **Capability** – Tracks and monitors capability that could be required in a hydrocarbon incident, including but not limited to: integrated fleet[5] vessel schedule, dispersant availability, rig/vessels monitoring, equipment stockpiles, tracking buoy locations and the CIMT duty roster.

d) **Compliance & Assurance** – Ensures all regulator inspection outcomes are actioned and closed out, the global legislation register is up to date and that the key assurance components are tracked and managed. Assurance activities (including Audits) conducted on memberships with key Oil Spill Response Organisations (OSROs) including AMOSC and OSRL are also tracked and recorded in the ICE.

The ICE assurance process records how each commitment listed in the performance tables above is managed to ensure ongoing compliance monitoring. The level of compliance can be reviewed in real time and is reported on a monthly basis through the S&EM Function.

The completion of the assurance checks (over and above the ICE process) is also applied via the Woodside Integrated Risk & Compliance System (WiRCs) and subject to the requirements of Woodside's Provide Assurance Procedure.

### *4. The hydrocarbon spill preparedness and response procedure*

This procedure sets out how to plan and prepare for a liquid hydrocarbon spill to the marine environment. (Note, this procedure does not apply to scenarios relating to gas releases in the marine environment).

This procedure details the:

- Requirement for an Oil Pollution Emergency Plan (OPEP) to be developed, maintained, reviewed, and approved by appropriate regulators (where applicable) including:
  - Defining how spill scenarios are developed on an activity specific basis;
  - Developing and maintaining all hydrocarbon spill related plans;
  - Ensuring the ongoing maintenance of training and competency for personnel;
  - Developing the testing of spill response arrangements; and
  - Maintaining access to identified equipment and personnel.
- Planning for hydrocarbon spill response preparedness
- Accountabilities for hydrocarbon spill response preparedness
- Spill training requirements
- Requirements for spill exercising / testing of spill response arrangements

[5] The Integrated fleet consists of vessels from multiple operators that have been contracted to Woodside to undertake a number of duties including hydrocarbon spill response

- Spill equipment and services requirements.

The procedure also details the roles and responsibilities of the dedicated Woodside Hydrocarbon Spill Preparedness team. This team is responsible for:

- Assuring that Woodside hydrocarbon spill responders meet competency requirements.
- Establishing the competency requirements, annual training schedule and a training register of trained personnel.
- Establishing and maintaining the total numbers of trained personnel required to provide an effective response to any hydrocarbon spill incident.
- Ensuring equipment and services contracts are maintained
- Establishing OPEPs
- Establishing OPEAs
- Priority response receptor determination
- ALARP determination
- Ensuring compliance and assurance is undertaken in accordance with external and internal requirements.

# 6 MONITOR AND EVALUATE – ALARP ASSESSMENT

Alternative, Additional and Improved options have been identified and assessed against the base capability described in **Section 5** with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

## 6.1 Monitor and Evaluate – Control Measure Options Analysis

### 6.1.1 Alternative Control Measures

| **Alternative Control Measures considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Aerostat (or similar inflatable observation platform) for localised aerial surveillance. | Lead time to Aerostat surveillance is disproportionate to the environmental benefit. The system also provides a very limited field of visibility around the vessel it is deployed from. | Long lead time to access (>10 days). Each system would require an operator to interpret data and direct vessels accordingly. Requires multiple systems for shoreline use. | Purchase cost per system approx. A$300,000. | This option is not adopted as the minimal environmental benefit gained is disproportionate to the cost and complexity of its implementation. | No |

### 6.1.2 Additional Control Measures

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Additional personnel trained to use systems. | Current arrangement provides an environmental benefit in the availability of trained personnel facilitating access to monitoring data used to inform all other response techniques. No improvement required. | No improvement can be made, all personnel in technical roles e.g. intelligence unit are trained and competent on the software systems. Personnel are trained and exercised regularly. Use of the software and systems forms part of regular work assignments and projects. | Cost for training in-house staff would be approx. A$25,000. | This option is not adopted as the current capability meets the need. | No |
| Additional satellite tracking buoys to enable greater area coverage. | Increased capability does not provide an environmental benefit compared to the disproportionate cost in having an additional contract in place. | Tracking buoy on location at manned facility, additional needs are met from Woodside owned stocks in King Bay Support Base (KBSB) and Exmouth or can be provided by service provider. | Cost for an additional satellite tracking buoy would be A$200 per day or A$6000 to purchase. | This option is not adopted as the current capability meets the need, but additional units are available if required. | No |
| Additional trained aerial observers. | Woodside has access to a pool of trained, competent observers at strategic locations to ensure timely and sustainable response. Additional observers are available through current contracts with AMOSC and OSRL. | Aviation standards and guidelines ensure all aircraft crews are competent for their roles. Woodside maintains a pool of trained and competent aerial observers with various home base locations to be called upon at the time of an incident. Regular audits of oil spill response organisations ensure training and competency is maintained. | Cost for additional trained aerial observers would be A$2000 per person per day. | This option is not adopted as the current capability meets the need, but additional observers are available via response contractors if required. | No |

### 6.1.3 Improved Control Measures

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Faster turnaround time from modelling contractor. | Improved control measure does not provide an environmental benefit compared to the disproportionate cost in having an additional contract in place. | External contractor on CIMT roster to be called as soon as required. However initial information needs to be gathered by CIMT team to request an accurate model. External contractor has person on call to respond from their own location. | Modelling service with a faster activation time would be achieved via membership of an alternative modelling service at an annual cost of A$50,000 for 24hr access plus an initial A$5000 per modelling run. | This option is not adopted as the minimal environmental benefit gained is disproportionate to the cost and complexity of its implementation. | No |
| Night time aerial surveillance. | The risk of undertaking the aerial observations at night is disproportionate to the limited environmental benefit. The images would be of low quality and as such the variable is not adopted. | Flights will only occur when deemed safe by the pilot. The risk of night operations is disproportionate to the benefit gained, as images from sensors (IR, UV, etc) will be low quality.<br>Flight time limitations will be adhered to. | No improvement can be made without risk to personnel health and safety and breaching Woodside's Golden Rules. | This option is not adopted as the safety considerations outweigh any environmental benefit gained. | No |

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| Faster mobilisation time (for water quality monitoring). | Due to the restriction on accessing the spill location on Day one there is no environmental benefit in having vessels available from day one. The cost of having dedicated equipment and personnel is disproportionate to the environmental benefit. The availability of vessels and personnel meets the response need.<br>Shortening the timeframes for vessel availability would require dedicated response vessels on standby in KBSB.<br>The cost and organisational complexity of employing two dedicated response vessels (approximately $15M/year per vessel) is considered disproportionate to the potential environmental benefit to be realised by adopting this delivery options. | Operations are not feasible on day 1 as the hydrocarbon will take time to surface, and volatility has potential to cause health concerns within the first 24 hours of the response. | Cost for purchase of equipment approx. A$200,000. Ongoing costs per annum for cost of hire and pre-positioning for life of asset/activity would be larger than the purchase cost.<br>Dedicated equipment and personnel, living locally and on short notice to mobilise. The cost would be approx. A$1 m per annum, which is disproportionate to the incremental benefit this would provide, assets are already available on day 1. 2 integrated fleet vessels are available from day 1, however these could be tasked with other operations. | This option is not adopted as the area could not be accessed earlier due to safety considerations. Additionally, the cost and complexity of implementation outweighs the benefits. | No |

### 6.1.4 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.2 Source control via Vessel SOPEP – ALARP assessment

Alternative, Additional and Improved options have been assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.2.1 Source Control via Vessel SOPEP – Control Measure Options Analysis

#### 6.2.1.1 Alternative control measures

| **Alternative Control Measures considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Cost** | **Implemented** |
| No reasonably practical alternative control measures identified. | | | | N/A |

#### 6.2.1.2 Additional Control Measures

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Cost** | **Implemented** |
| No reasonably practical alternative control measures identified. | | | | N/A |

#### 6.2.1.3 Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Cost** | **Implemented** |
| No reasonably practical alternative control measures identified. | | | | N/A |

### 6.2.2 Selected control measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.3 Source Control – ALARP Assessment

Woodside has based its response planning on the worst-case credible scenarios (as described in **Section 2.2**). This includes the following selection of source control and well intervention techniques which would be initiated concurrently:

- ROV intervention
- debris clearance and/or removal
- capping stack deployment
- relief well drilling

### 6.3.1 ROV Intervention

Following confirmation of an LOWC event, Woodside would mobilise inspection class ROVs to assess the status of the wellhead and BOP equipment (BOPE). If available, the ROV on the MODU can be deployed for this purpose within 48 hours. Work class ROVs for well intervention are also available through the existing frame agreements and are available for deployment within seven days (**Table 6-1**). It is not expected that any additional regulatory approvals would be required as inspection, maintenance and repair is within the scope of activities for the Scarborough Operations Safety Case as well as the scope of activities for contracted Frame Agreement vessels.

As Woodside holds Frame Agreements for vessels along with contracts for ROV providers and pilots, inspection activities using ROVs are expected to commence within seven days.

A hydraulic accumulator contained as part of the SFRT can be mobilised and deployed with well intervention attempted within 11 days.

**Table 6-1: ROV timings**

| ROV inspection duration for Scarborough Wells | Time Estimate (days) |
|---|---|
| Source and mobilise vessel with work class ROV | 2 days |
| Liaise with Regulator regarding risks and impacts* | 4 days |
| Undertake ROV Inspection | 1 day |
| **TOTAL** | **7 days*** |

** Based on timings from the Report into the Montara Commission of Enquiry, submission and discussion of revised documentation for limited activities inside the Petroleum Safety Zone (water deluge operations) to manage personnel risks and impacts was up to 20 days.*

#### 6.3.1.1 Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1661), confirming that vessels conducting subsea intervention operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements to be in place. In the event of an emergency, Woodside has access to suitable vessels (ISVs) for well intervention through existing frame agreements. The frame agreements for ISV vessels require the vessels to maintain in-force safety case approval covering a range of subsea activities. This would cover the requirement for intervention operations such as subsea manifold installation, maintenance and repair, commissioning,

cargo transfer (including bulk liquids) and ROV operations. With frame agreements in place, the credible Safety Case Scenario from those presented in **Figure 6-3** for implementing this response would be “no safety case revision required”. Timeframes for well intervention are detailed in **Figure 6-2** and would be implemented concurrently to the actions required by the “no Safety Case” revision scenario detailed in **Figure 6-3,** therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

### 6.3.2 Debris clearance and/or removal

The Woodside Source Control Response Guideline details the mobilisation and resource requirements for implementing this strategy. Debris clearance may be required as a prerequisite to deployment of the capping stack. The AMOSC SFRT would be mobilised from Fremantle. The mobilisation of the SFRT would take place in parallel with mobilisation of the capping stack to ensure initial ROV surveys and debris clearance have commenced before the arrival of the capping stack. The SFRT comprises ROV-deployed cutters and tools that are used to remove damaged or redundant items from the wellhead and allow improved access to the well. The SFRT can be mobilised and deployed with well intervention attempted within 11 days.

#### 6.3.2.1 Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1661) and can confirm that vessels conducting debris clearance and removal operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements in place. In the event of an emergency, Woodside has access to suitable ISVs for these operations through existing frame agreements. The frame agreements for ISVs require the vessels to maintain in-force safety case approval covering a range of subsea activities. This would cover the requirement for debris clearance and removal operations such as subsea manifold installation, commissioning, cargo transfer (including bulk liquids) and ROV operations. With frame agreements in place, the credible Safety Case Scenario, from those presented in **Figure 6-3** for implementing this response would be “no safety case revision required”. Timeframes for debris clearance and removal equipment deployment are detailed in **Figure 6-2** and would be implemented concurrently to the actions required by the “No Safety Case” revision scenario detailed in **Figure 6-3**, therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

### 6.3.3 Capping stack

The Woodside Source Control Response Guideline details the mobilisation and resource requirements for implementing this strategy. A capping stack is designed to be installed on a subsea well and provides a temporary means of sealing the well, until a permanent well kill can be performed through either a relief well or well re-entry.

Woodside has developed a project specific capping stack deployment plan and also commissioned an independent, capping stack landing study for the Scarborough wells (WWCI, 2021). The study indicates that the safe deployment of a capping stack is feasible.

Woodside assumes that sourcing conventional capping stack deployment vessels would be per the Source Control Response Guideline. This plan has pre-identified vessel specifications for the capping stack deployment and Woodside monitors the availability and location of these vessels on a monthly basis. Woodside maintain several frame agreements with various vessel service providers and maintains the ability to call off services with a capping stack and debris clearance agreement. The location of suitable vessels for capping stack deployment are monitored monthly. The supply arrangements and reliability to achieve the required

mobilisation time will be revalidated prior to spud. Consideration to mobilise the capping stack from the supplier on a suitable vessel but then hand over to another vessel to conduct the capping activity will also be made to meet response time frames.

A capping stack will be mobilised to site within 16 days. Woodside will monitor the conditions around the wellsite and deployment for well intervention attempt will be undertaken once safety and metocean conditions are suitable.

#### 6.3.3.1 Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1661) and can confirm that vessels conducting capping stack are not classified as an "associated offshore place" but as a facility and therefore require the appropriate Safety Case arrangements in place.
The timeframe to mobilise the vessel is based on the following assumptions:

- existing frame agreement vessel, located outside the region with approved Australian Safety Case
- a safety case revision and scope of validation is required
- vessel has an active heave compensated crane, rated to at least 150 T in shallower water and 250 T in deeper water, and at least 90 m in length and a deck capacity to hold at least 110 T of capping stack.

Timeframes for capping stack deployment detailed in **Figure 6-2** would be implemented concurrently with the actions required for the Safety Case revision development scenarios detailed in **Figure 6-3** and **Table 6-3**. To reduce uncertainty in regulatory approval timeframe, Woodside is collaborating with The Drilling Industry Steering Committee (DISC) and a contracted ISV Vessel Operator to develop a generic Safety Case Revision that contemplates a capping stack deployment. This Safety Case Revision will be used to reduce uncertainty in permissioning timeframes in the event a capping stack deployment is required. Woodside will execute the capping stack response in the fastest possible timeframe, provided the required safety and metocean conditions allow. Woodside has considered a broad range of alternate, additional, and improved options as outlined later in **Section 6.3.5**.

### 6.3.4 Relief Well drilling

The options analysis detailed in this section considers options to source, contract and mobilise a MODU or MODUs and ensure necessary regulatory approvals are in place to meet timelines for relief well drilling. The screening for relief well drilling MODUs is based on the following and the process used for Scarborough is illustrated in **Figure 6-1**:

- Primary – review internal Woodside drilling programs and MODU availability to source appropriate rig(s) operating within Australia with an approved Safety Case.
- Alternate – source and contract a MODU through APPEA MoU that is operating within Australia with an approved Safety Case.
- Contingency – Source and contract a MODU outside Australia with an approved Australian Safety Case.

For the worst-case discharge scenario modelled, an additional MODU, subsea well kill spools and hoses is required to provide pumping assistance to the primary relief well drilling rig. The MODU will be obtained per the above hierarchy.

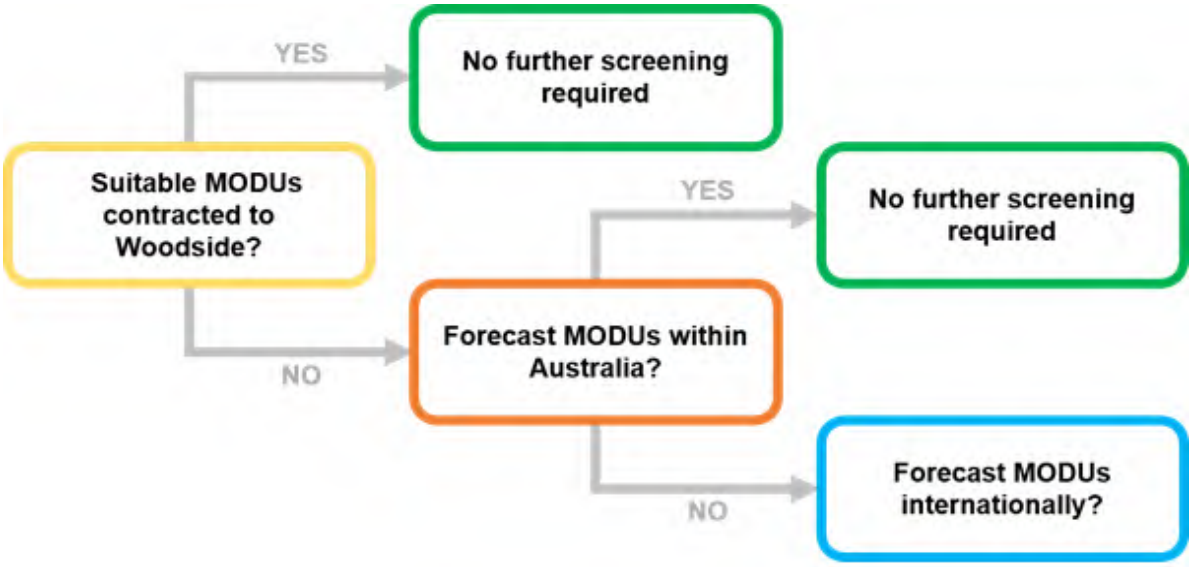


**Figure 6-1: Process for sourcing relief well MODU**

Screening of a relief well MODU from international waters is undertaken only if required, i.e. there is low confidence in local (Australian) availability. The screening of relief well MODUs is undertaken and presented at a well design stage peer assessment. The capability, location and Australian Safety Case status is assessed for each Woodside contracted MODU. In the event the Woodside contracted MODUs are unsuitable, screening is extended to all MODUs operating in Australian Waters. The suitability and location of pre-identified relief well MODUs is tested again prior to the operation. Though the APPEA MoU will serve as the instrument to facilitate the transfer of drilling units and well site services between operators in the event of an emergency, Woodside will engage each of the identified titleholders in advance to maintain confidence in MODU suitability and availability.

Based on the detail provided, the Primary and Alternate approaches are expected to be achieved within the 21-day period.

The internal and external availability of moored and DP MODUs, plus rig activities of registered operators and rigs with approved safety cases, are tracked by Woodside on a monthly basis, with a two-year look ahead, to ensure that the best available option can be sourced and utilised in the event of the worst-case credible scenario.

If the above forecast indicates a gap in availability of a suitable MODU for relief well drilling within Australia, screening would be extended to MODUs with a valid safety case outside Australia. If an international MODU with an Australian safety case is not identified, an internal review will be undertaken, NOPSEMA notified and the issue tabled at the APPEA Drilling Industry Safety Committee. A review of the significance of the change in risk will be undertaken in accordance with Woodside's environment management of change requirements and relevant regulatory triggers. The aforementioned lookahead timeframe would allow two years' warning of any potential gap. Woodside will execute relief well drilling in the fastest possible timeframe.

The detail of these arrangements demonstrates that the risks have been reduced to ALARP and Acceptable levels through the control measures and performance standards outlined in **Section 5.2**.

#### 6.3.4.1 Relief Well drilling timings

The duration of a blowout (from initiation to a successful kill) is assessed as 65.3 days. The Scarborough development wells are very similar in their lengths, depths and casings. The wells with the worst-case discharge rates were modelled for relief well planning.

Details on the steps and time required to drill a relief well is shown in **Table 6-2** below. Moored and DP MODUs are suitable.

To validate the effectiveness of the relief MODU supply arrangements through the APPEA MoU, the 21-day mobilisation period was tested in April 2019 in an exercise facilitated by an external party. This exercise included suspension of the assisting operator's activities, contracting the MODU, vessel safety case revision and transit to location. The testing of mobilisation arrangements has been incorporated into Woodside's Hydrocarbon Spill Arrangements Testing Schedule.

**Table 6-2: Relief well drilling timings**

| Estimated Time to Relief Well Intersection / Well Kill | |
|---|---|
| **Source and contract MODU:** | **21.0 days** |
| *Activate MoU. Secure and suspend well.* | *8.0 days* |
| *Complete relief well design.* | |
| *Secure relief well materials.* | |
| *Transit to location based on mobilization from Northwest shelf region.* | *2.0 days* |
| *Backload and loadout bulks and equipment, complete internal assurance of relief well design.* | *2.0 days* |
| *Contingency for unforeseen event (e.g.: Longer transit from another area of Australia, problems in securing well, cyclone event)* | *9.0 days* |
| **Relief Well Construction:**<br>Note: This includes the time taken to install subsea kill spools and hoses | **24.8 days** |
| **Intersection & Well Kill:** | **19.5 days** |
| *Drill out shoe, conduct formation integrity test and drill towards intersection point* | *1.5 days* |
| *Execute well-specific ranging plan to intersect blowout wellbore in minimum timeframe, with highest possible accuracy (3x open hole ranging sidetracks).* | *15.0 days* |
| *Pump kill weight drilling fluid per the relief well plan. Confirm the well is static with no further flow.* | *0.5 days* |
| *Contingency for unforeseen technical issues (e.g.: more ranging runs required to make intersect, additional mud circulations required to execute kill* | *2.5 days* |
| **Total** | **65.3 days** |

Woodside has considered a broad range of alternate, additional, and improved options as outlined in **Section 6.3.5**.

Intersect and kill duration is estimated at 19.5 days. This is a moderately conservative estimate. During the intersect process, the relief well will be incrementally drilled and logged to accurately approach and locate the existing well bore. This will result in the highest probability of intersecting the well on the first attempt and thus will reduce the overall time to kill the well. During the Montara incident, it took five attempts to achieve a successful intersect.

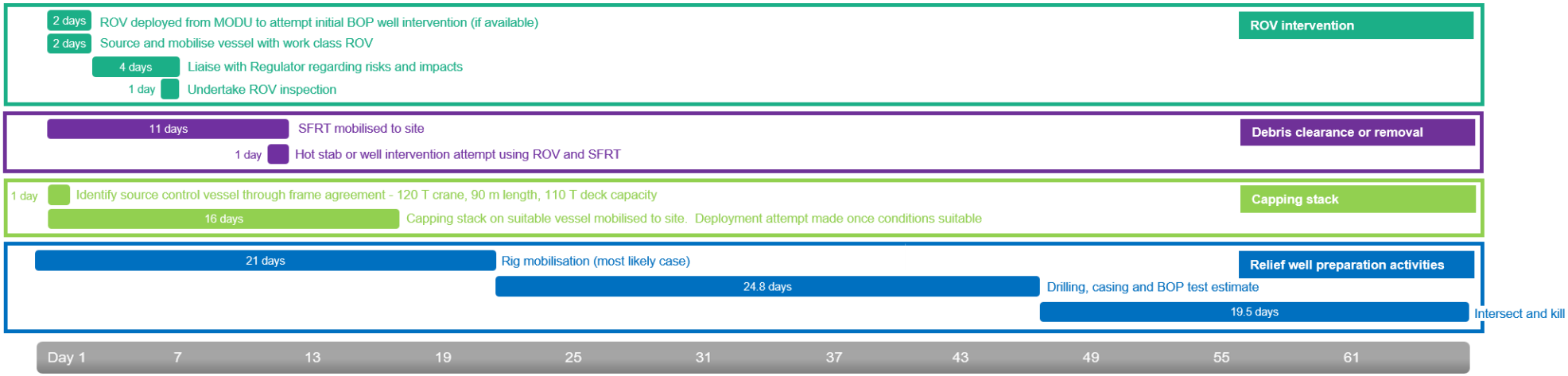


**Figure 6-2: Source control and well intervention response strategy deployment timeframes for Scarborough Development Wells**

#### 6.3.4.2 Safety Case considerations

Woodside recognises that it will not be the Operator or holder of the Safety Case for the MODU and/or vessels involved in relief well activities. In the event that a revision to the Operator's Safety Case is required for relief well drilling, Woodside has identified measures to ensure timely response and optimise preparedness as far as practicable that can be undertaken to expedite a straightforward Safety Case revision for a MODU/ vessel to commence drilling a relief well. Performance standards associated with these measures have been included in Section 5.2.

These include;

- Access to Safety and Risk discipline personnel with specialist knowledge.
- Monitoring internal and external rigs and vessel availability in the region and extended area through contracted arrangements on a monthly basis, with a two-year lookahead.
- Prioritisation of rigs/vessels with current or historical contracting arrangements. Woodside maintains records of previous contracting arrangements and companies. All current contracts for vessels and rigs are required to support Woodside in the event of an emergency.
- Leverage mutual aid arrangements such as the APPEA MoU for vessel and rig support.
- Woodside Planning and Logistics, and Safety Officers (on-Roster/Call 24/7) which can articulate need for, and deliver Woodside support, in key delivery tasks including sitting with potential outside operators.
- Ongoing strategic industry engagement and collaboration with NOPSEMA to work toward time reductions in regulatory approvals for emergency events.

Woodside has identified three safety case revision development and submission scenarios for a MODU and plotted these alongside the relief well preparation activities in **Figure 6-3**. The assumptions for each of the cases are detailed in subsequent **Table 6-3**.

The MODUs screened for contingency relief well drilling all operate under an Accepted base Safety Case. A relief well Safety Case Revision would leverage the previously accepted Safety Case Revision for the PAP, including the associated site-specific well hazards. As such, there is less new detail for the regulator to review and should present a short review timeframe with no impact expected to the commencement of relief well drilling activities.

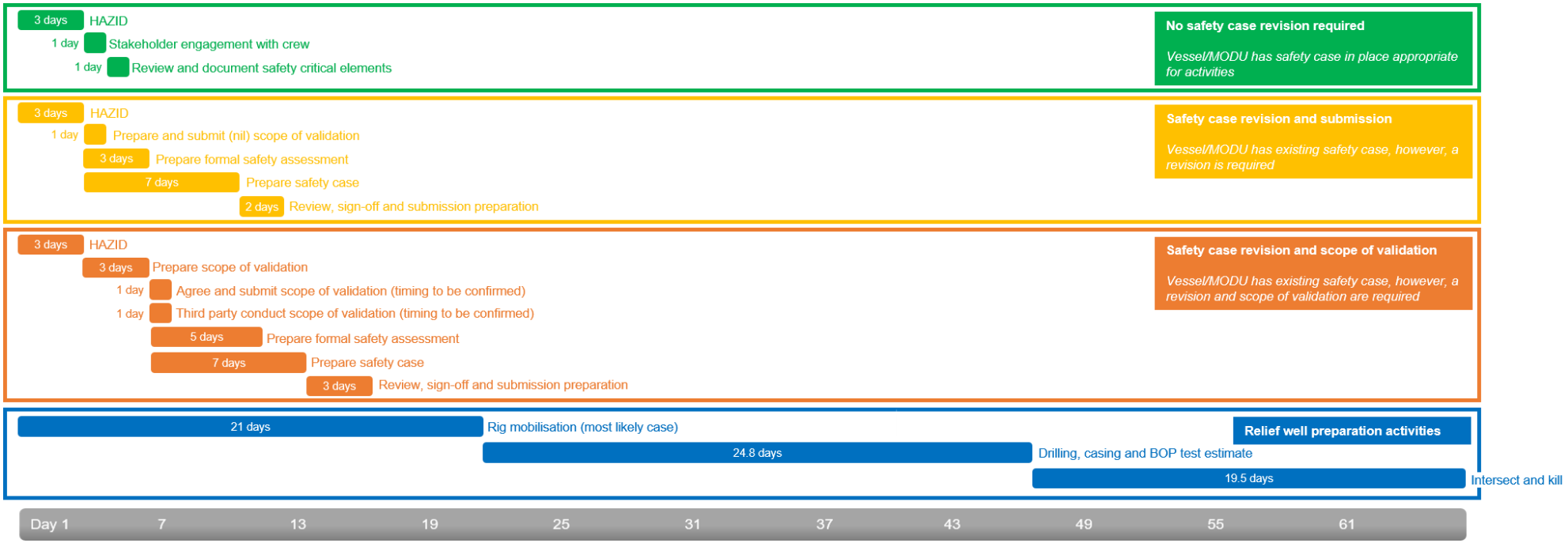


**Figure 6-3: Timeline showing safety case revision timings alongside other relief well preparation activity timings for Scarborough Development Wells**

**Table 6-3: Safety case revision conditions and assumptions**

| Case | No safety case revision required | Safety case revision and submission | Safety case revision and scope of validation |
|---|---|---|---|
| **Description** | Vessel/MODU has a safety case in place appropriate for activities. | Vessel/MODU has an existing safety case, however, a revision is required. | Vessel/MODU has an existing safety case, however, a revision is required plus scope of validation. |
| **Conditions/ assumptions** | • Assumes that existing vessel/MODU safety case covers working under the same conditions or the loss of containment is not severe enough to result in any risk on the sea surface. | • Safety case timing assumes vessel/MODU selected and crew and available for workshops and safety case studies. | • Safety case timing assumes vessel/ MODU selected and crew and available for workshops and safety case studies. |
| | | • Assumes nil scope of validation. This assumes that the vessel for subsea dispersant injection allows for working in a hydrocarbon environment and control measures are already in place in the existing safety case. For MODU, it assumes that the relief well equipment is already part of the MODU facility and MODU safety case. | • Validation will be required for new facilities only. The time needed for the validator to complete the review (from the last document received) and prepare validation statement is undetermined. This is not accounted for here as the safety case submission is not dependent on the validation statement, however the safety case acceptance is. |
| | | • Assumes safety case preparation is undertaken 24/7. | • Assumes safety case preparation is undertaken 24/7. |

### 6.3.5 Source Control – Control Measure Options Analysis

The assessments described in Sections 6.3.1, 6.3.2, 6.3.3 and 6.3.4 outline the primary and alternate approaches that Woodside would implement for source control. In Sections 6.3.6 and 6.3.7, Woodside has outlined the options considered against the activation/mobilisation (alternative, additional and improved options) and deployment (additional and improved options) processes as described in Section 2.1.1. This assessment provides an evaluation of:

- predicted cost associated with adopting the option
- predicted change/environmental benefit
- predicted effectiveness/feasibility of the option.

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical.

- Alternative options, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control.
- Additional control measures are evaluated in terms of their ability to reduce an impact or risk when added to the existing suite of control measures.
- Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility.

Options where there is not a clear justification for their inclusion or exclusion may be subject to a detailed assessment.

#### 6.3.5.1 Activation/Mobilisation Options considered

**Alternative**

- Standby MODU shared for all Woodside activities
- Standby MODU shared across APPEA MoU Titleholders

**Additional**

- Implement and maintain minimum standards for Safety Case development

**Improved**

- Monitor internal drilling programs for rig availability
- Monitor external activity for rig availability
- Monitor status of Registered Operators/ Approved Safety cases for rigs

#### 6.3.5.2 Deployment Options considered

**Additional**

- Offset capping alternative to conventional capping stack deployment
- Dual vessel capping stack deployment
- Subsea Containment System alternative to capping stack deployment
- Pre-drilling top-holes
- Purchase and maintain mooring system
- Contract in place with WWCI and Oceaneering

**Improved**

- Maintaining relief well drilling supplies (mud, casing, etc).

### 6.3.6 Activation/Mobilisation – Control Measure Options Analysis

This section details the assessment of alternative, additional or improved control measures that were considered to ensure the selected level of performance in Section 5.3 reduces the risk to ALARP. The Alternative, Additional and Improved control measures that have been assessed and selected are highlighted in green and the relevant performance of the selected control is cross referenced. Items highlighted in red have been considered and rejected on the basis that they are not feasible or the costs are clearly grossly disproportionate compared to the environmental benefit.

#### 6.3.6.1 Alternative control measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Feasibility** | **Environmental benefits/impacts** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Standby MODU shared for all Woodside activities | A standby MODU shared across all Woodside activities is likely to provide a moderate environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to 10 days (to 11 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities. | This option is not considered feasible for all Woodside activities as there are a large range of well depths, complexities, geologies and geophysical properties across all Woodside's operations. The large geographic area of Woodside activities also means that the MODU is unlikely to be in the correct location at the right time when required. | Even with costs shared across Woodside operations, the costs (approximately A$219 m per annum, A$1.95 b over the five years) of maintaining a shared MODU are considered disproportionate to the environmental benefit potentially achieved by reducing mobilisation times by up to 10 days. | The costs and complexity of having a MODU and maintaining this arrangement for the duration of the Petroleum Activities Program are disproportionate to the environmental benefit gained above finding a MODU through the MoU agreement for all spill scenarios. | No |
| Standby MODU shared across APPEA MoU Titleholders | A standby MODU shared across all titleholders who are signatories to the APPEA MoU is likely to provide a minor environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to seven days (to 14 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities. | This option is not considered feasible for a number of Titleholders due to the remote distances in Australia as well as a substantial range of well depths, types, complexities, geologies and geophysical properties across a range of Titleholders | As the environmental benefit is only considered minor and the reduction in timing would only be for the mobilisation period (reduction from 21 days to 14 days) the costs are considered disproportionate to the minor benefit gained. | The costs and complexity of having a MODU and maintaining a shared arrangement for the duration of the Petroleum Activities Program are disproportionate to the environmental benefit gained above finding a MODU through the MoU agreement for all spill scenarios. | No |

#### 6.3.6.2 Additional control measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Feasibility** | **Environmental benefits/impacts** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Implement and maintain minimum standards for Safety Case development | Woodside's contingency planning consideration would be to source rigs from outside Australia with an existing Safety Case. This would require development and approval of a safety case revision for the rigs and activities prior to commencing well kill operations. | This option is considered feasible and would require Woodside to develop minimum standards for safe operations for relevant Safety Case input along with maintaining key resources to support review of Safety Cases. Woodside would not be the operator for relief well drilling and would therefore not develop or submit the Safety Case revision. Woodside's role as Titleholder would be to provide minimum standard for safe operations that MODU operators would be required to meet and/or exceed. | Woodside has outlined control measures and performance standards regarding template Safety Case documentation and maintenance of resources and capability for expedited Safety Case review. | This option has been selected based on its feasibility, low cost and the potential environmental benefits it would provide. | Yes |

### 6.3.6.3 Improved control measures

| **Improved control measures Considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Feasibility** | **Environmental benefits/impacts** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Monitor internal drilling programs for rig availability | Woodside may be conducting other campaigns that overlap with the Petroleum Activities Program, potentially providing availability of relief well drilling rigs within Woodside.<br>The environmental benefit of monitoring other drilling programs internally is that Woodside would be in a position to understand which other rigs might be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment. | Woodside monitors vessel and MODU availability through market intelligence services for location. Woodside will continually monitor other drilling and exploration activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations. | Associated cost of implementation is minimal to the environmental benefit gained.<br>Woodside has outlined control measures and performance standards. | This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment. | Yes |
| Monitor external activity for rig availability | The environmental benefit achieved by monitoring drilling programs and rig movements across industry provides the potential for increased availability of suitable rigs for relief well drilling. Additional discussions with other Petroleum Titleholders may be undertaken to potentially gain faster access to a rig and reduce the time taken to kill the well and therefore volume of hydrocarbons released. | Woodside will source relief well drilling rigs in accordance with the APPEA MoU on rig sharing in the unlikely event this is required. Commercial and operational provisions do not allow Woodside to discuss current and potential drilling programs in detail with other Petroleum Titleholders. | Associated cost of implementation is moderate to the environmental benefit gained. Woodside will continually engage with other Titleholders and Operators regarding activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations. | This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment. | Yes |
| Monitor status of Registered Operators / Approved Safety cases for rigs | Woodside can monitor the status of Registered Operators for rigs operating within Australia (and therefore safety case status) on a monthly basis. This allows for a prioritised selection of rigs in the event of a response with priority given to those with an existing safety case. | The environmental benefit of monitoring other drilling programs internally is that Woodside would be in a position to understand which other rigs might be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment. | The cost is minimal. | This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment. | Yes |

### 6.3.7 Deployment – Control Measure Options Analysis

#### 6.3.7.1 Additional Control Measures

**Additional Control Measures considered**
*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures*

| Option considered | Environmental consideration | Feasibility | Approximate cost | Assessment conclusions | Implemented |
|---|---|---|---|---|---|
| Offset capping alternative to conventional capping stack deployment | While the use of an offset capping system could reduce the quantity of hydrocarbon entering the marine environment, the mobilisation lead times for both a cap and required vessels/ support equipment, would minimise any environmental benefit gained over conventional capping. | • The base case considerations for offset installation equipment (OIE) requires a coordinated response by 4 to 7 vessels working simultaneously outside of the 500m exclusion zone introducing complex SIMOPS issues. Due to the OIE's size and scale, fabrication of equipment, e.g. mooring anchors, outside of the contractor's scope of supply is likely to require engagement of international suppliers, further increasing complexity and uncertainty in associated time frames.<br>• Screening indicates that mobilising some components of the OIE, based in Italy, can only be done so by sea and is likely to erode any time savings realised through killing the well via a relief well.<br>• The March 2019 OSRL exercise in Europe tested deployment of the OIE and highlighted that it will require a >600 T crane vessel for deployment to ensure there is useable hook height for the crane to conduct the lift of the carrier. Vessels with such capability and a current Australian vessel safety case are not locally or readily available. | Due to risks, uncertainty and complexity of this option, and the inability to realise any environmental gains, any cost would be disproportionate to the benefits gained over conventional capping. | Woodside has confidence in availability of suitable relief well MODUs across the required drilling time frame thus the OIE would provide no advantage.<br>Implementation of OIE has been assessed as a highly complex SIMOPs operation.<br>Implementation of a novel technology such as OIE culminates in low certainty of success while at the same time increasing associated health and safety risks.<br>As such the primary source control response and ALARP position remain conventional capping and drilling a relief well. | No |
| Dual vessel capping stack deployment | While the use of dual vessel to deploy the capping system could reduce the quantity of hydrocarbon entering the marine environment, this is an unproven technology. Additionally, the feasibility issues surrounding a dual vessel capping deployment together with mobilisation lead times for both a cap and required vessels and support equipment, would minimise any environmental benefit gained over conventional capping. | A dual vessel deployment is somewhat feasible provided a large enough deck barge can be located. Deck barges of 120 m are not, however, very common and will present a logistical challenge to identify and relocate to the region. Further, the longer-length barges may need mooring assist to remain centred over the well. The capping stack would be handed off from a crane vessel to the anchor handler vessel (AHV) work wire outside of the exclusion zone. The AHV would then manoeuvre the barge into the plume to get the capping stack over the well. In this method, the barge would be in the plume, but the AHV and all personnel would be able to maintain a safe position outside of the gas zone. The capping stack would actually be lowered on the AHV work wire so a crane would not be required on the barge. | Due to there being minimal environmental benefits gained by the prolonged lead times needed to execute this technique, plus a potential increase in safety issues, any cost would be disproportionate to the benefits gained over conventional capping. | Given there is minimal environmental benefit and an increase in safety issues surrounding SIMOPS and deployment in shallow waters, this option would not provide an environmental or safety benefit. | No |
| Subsea containment system alternative to capping stack deployment | While the use of a subsea containment system could reduce the quantity of hydrocarbon entering the marine environment, this is an unproven technology. Additionally, the system is unlikely to be feasibly deployed and activated for at least 90 days following a blowout due to equipment requirements and logistics. No environmental benefit is therefore predicted given the release duration is 65.3 days before drilling of a relief well under the adopted control measure. | The timing for mobilisation, deployment and activation of the subsea containment system is likely to be >90 days which is longer than the expected 65.3 days relief well drilling operations based on the location, size and scale of the equipment required, including seabed piles that can only be transported by vessel. | Woodside has investigated the logistics of reducing this timeframe by pre-positioning equipment but the costs of purchasing dedicated equipment by Woodside for this Petroleum Activities Program is not considered reasonably practical and are considered disproportionate to the environmental benefit gained. | This option would not provide an environmental benefit. | No |
| Pre-drilling (relief well) top-holes | This option represents additional environmental impacts associated with discharge of additional drill cuttings and fluids along with benthic habitat disturbance. It is also not expected to result in a significant decrease in relief well timings | This option is not considered feasible due to the uncertainties related to the location and trajectory of the intervention well, which may vary according to the actual conditions at the time the loss of containment event occurs. Additionally, there is only expected to be a minor reduction in timing for this option of 1-2 days based on the drilling schedule. Duration to drill and kill may be reduced by 1-2 days, but top-hole may have to be relocated, due to location being unsafe or unsuitable and further works will be required each year to maintain the top holes. | Utilising an existing MODU and pre-drilling top-hole for relief well commencement would significantly increase costs associated the Petroleum Activities Program. Estimated cost over the program's life is approx. A$555,000 per day over the PAP based on 2-4 days of top-hole | This option would not provide an environmental benefit due to the additional environmental impacts coupled with a lack of improved relief well timings. | No |

| | | | | | |
|---|---|---|---|---|---|
| | | | drilling (plus standby time) for the well as the worst-case scenario. | | |
| Purchase and maintain mooring system | Purchasing and maintaining a mooring system could provide a moderate environmental benefit as it may reduce equipment sourcing time. However, due to the continued need for specialists to install the equipment plus sourcing a suitable vessel, the timeframe reduction would be minimal. | Woodside is not a specialist in installing and maintaining moorings so would require specialists to come in to install the moorings and would also require specialist vessels to be sourced to undertake the work. | The cost of purchasing, storing and maintaining pre-lay mooring systems with anchors, chains, buoys and ancillary equipment is considered disproportionate to the environmental benefit gained. | This option would not provide an environmental benefit as timeframe reductions would be minimal. | No |
| Contract in place with WWCI and Oceaneering | Woodside has an agreement in place with WWCI and Oceaneering to provide trained personnel in the event of an incident. This will ensure that competent personnel are available in the shortest possible timeframe. | Having contracts in place to access trained, competent personnel in the event of an incident would reduce mobilisation times. This option is considered reasonably practicable. | Minimal cost implications – Woodside has standing contract in place to provide assistance across all activities. | This control measure is adopted as the costs and complexity are not considered disproportionate to any environmental benefit that might be realised. | Yes |

### 6.3.7.2 Improved Control Measures

**Improved Control Measures considered**
*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility*

| Option considered | Environmental consideration | Feasibility | Approximate cost | Assessment conclusions | Implemented |
|---|---|---|---|---|---|
| Maintaining relief well drilling supplies | There is not predicted to be any reduction in relief well timing or spill duration from Woodside maintaining stocks of drilling supplies (mud, casing, cement, etc.) | It would be feasible to source some relief well drilling supplies such as casing but the actual composition of the cement and mud required will need to be specific to the well. This option is also not deemed necessary as the lead time for sourcing and mobilising these supplies is included in the 21 days for sourcing and mobilising a rig. | The capital cost of Woodside purchasing relevant drilling supplies is expected to be approximately A$600,000 with additional costs for storage and ongoing costs for replenishment. These costs are considered disproportionate to the environmental benefit gained. | This option would not provide an environmental benefit. | No |

### 6.3.8 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - Implement and maintain minimum standards for Safety Case development
  - Contract in place with WWCI and Oceaneering to supply trained, competent personnel
- Improved
  - Monitor internal drilling programs for MODU availability
  - Monitor external activity for MODU availability
  - Monitor status of Registered Operators / Approved Safety cases for MODUs

## 6.4 Wildlife response – ALARP assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.4.1 Existing capability – wildlife response

Woodside's exiting level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, re-fuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

### 6.4.2 Wildlife response – control measure options analysis

#### 6.4.2.1 Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Implemented** |
| Direct contracts with service providers instead of those sources through Scarborough | Adoption of this control would provide minimal net environmental benefit as the resources supplied through AMOSC and OSRL would likely be shared by the direct contracts. | It is feasible to have direct contracts with service providers; however, this option duplicates the capability accessed through AMOSC and OSRL, potentially competing for the same resources. | Given there is no environmental benefit, any costs are disproportionate to the benefit gained. | No |

#### 6.4.2.2 Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Implemented** |
| Additional wildlife treatment systems | Current arrangements allow for all wildlife to be treated. Hydrocarbon is only limited to open water above the impact threshold. Therefore, there is no environmental benefit for having additional wildlife treatment systems as current capability meets the need. | Current arrangements allow response equipment and personnel to be delivered by day one, scaling up by day six, enough to treat up to 600 wildlife. An additional wildlife treatment system is feasible and would potentially reduce the time to deploy additional wildlife systems. | Given there is no environmental benefit, any costs are disproportionate to the benefit gained. | No |
| Additional trained wildlife responders | Current numbers meet the needs required and additional personnel are available through existing contracts with oil spill response organisations and environmental panel contractors. Numbers of oiled wildlife are expected to be low in the remote offshore setting of the oiled wildlife response, given the distance from known aggregation areas.<br>The potential environmental benefit of training additional personnel is expected to be low. | Providing additional trained wildlife responders is feasible, however current capacity provides the capacity to treat approximately 600 wildlife units (primarily avian fauna) by day six, with additional capacity available from OSRL. | Given there is no environmental benefit, any costs are disproportionate to the benefit gained. | No |

#### 6.4.2.3 Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Implemented** |
| Faster mobilisation time for wildlife response through pre-positioned equipment and personnel. | Response time is limited by specialist personnel mobilisation time. Current timing is sufficient considering there is no potential for shoreline receptors to be contacted.<br><br>This control measure provides increased effectiveness through faster mobilisation of specialists. However, no significant net environmental benefit is expected due to shoreline stranding times. | The selected delivery options provide the capacity to mobilise an oiled wildlife response capable of treating up to 600 wildlife from at least day six and exceeds the estimated Level 4 OWR response thought to be applicable. This delivery option provides the maximum expertise pooled across the participating operators, backed up by the international resources provided by OSRL. | The cost of having dedicated equipment and personnel available to respond faster is considered disproportionate to the environmental benefit. | No |

### 6.4.3 Selected control measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.5 Waste Management – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in **Section 5** with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.5.1 Existing Capability – Waste Management

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

### 6.5.2 Waste Management – Control Measure Options Analysis

#### 6.5.2.1 Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Implemented** |
| No reasonably practical alternative control measures identified. | | | | |

#### 6.5.2.2 Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Implemented** |
| Increased waste storage capability | The procurement of waste storage equipment options on the day of the event will allow immediate response and storage of collected waste. The environmental benefit of immediate waste storage is to reduce ecological consequence by safely securing waste, allowing continuous response operations to occur. | Access to Veolia's storage options provides the resources required to store and transport sufficient waste to meet the need. Access to waste contractors existing facilities enables waste to be stockpiled and gradually processed within the regional waste handling facilities. Additional temporary storage equipment is available through existing contract and arrangements with OSRL. Existing arrangements meet identified need for the PAP. | The cost of having increased waste storage capability is considered disproportionate to the environmental benefit. There is also no shoreline impact predicted, therefore, increased waste storage capability is not considered a benefit. | No |

#### 6.5.2.3 Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | |
|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Implemented** |
| Faster response time | The access to Veolia waste storage options provides the resources to store and transport waste, permitting the wastes to be stockpiled and gradually processed within the regional waste handling facilities.<br>Bulk transport to Veolia's licensed waste management facilities would be undertaken via controlled-waste-licensed vehicles and in accordance with Environmental Protection (Controlled Waste) Regulations 2004.<br>The environmental benefit from successful waste storage will reduce pressure on the treatment and disposal facilities reducing ecological consequences by safely securing waste. In addition, waste storage and transport will allow continuous response operations to occur.<br>This delivery option would increase known available storage, eliminating the risk of additional resources not being available at the time of the event. However, the environmental benefit of Woodside procuring additional waste storage is considered minor as the risk of additional storage not being available at the | Woodside already maintains an equipment stockpile in Exmouth to enable shorter response times to incidents. This stockpile includes temporary waste storage equipment.<br>Woodside has access to stockpiles of waste storage and equipment in Dampier and Exmouth through existing contracts and arrangements. | The incremental benefit of having a dedicated local Woodside owned stockpile of waste equipment and transport is considered minor and cost is considered disproportionate to the benefit gained given there is no predicted shoreline contact. | No |

| | | | | |
|---|---|---|---|---|
| | time of the event is considered low and existing arrangements provide adequate storage to support the response. | | | |

### 6.5.3 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.6 Scientific monitoring – ALARP assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.6.1 Existing Capability – Scientific Monitoring

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, re-fuelling/re-stocking provisions, and other similar logistic and operational limitations that are beyond Woodside's direct control.

### 6.6.2 Scientific Monitoring – Control Measure Options Analysis

#### 6.6.2.1 Alternative Control Measures

**Evaluate Alternative, Additional and Improved Control Measures**

**Alternative Control Measures considered**
*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control*

| Ref | Control Measure Category | Option considered | Implemented | Environmental Consideration | Feasibility / Cost |
|---|---|---|---|---|---|
| SM01 | System | Analytical laboratory facilities closer to the likely spill affected area | No | SM01 water quality monitoring requires water samples to be transported to National Association of Testing Authorities (NATA) rated laboratories in Perth or interstate. Consider the benefit of laboratory access and transportation times to deliver water samples and complete lab analysis. There is a time lag from collection of water samples to being in receipt of results and confirming hydrocarbon contact to sensitive receptors). The environmental consideration of having access to suitable laboratory facilities in Exmouth or Karratha to carry out the hydrocarbon analysis would provide faster turnaround in reporting of results only by a matter of days (as per the time to transport samples to laboratories). | Laboratory facilities and staff available at locations closer to the spill affected area can reduce reporting times only to a moderate degree (days) with associated high costs of maintaining capability do not improve the environmental benefit. |
| SM01 | System | Dedicated contracted SMP vessel (exclusive to Woodside) | No | Would provide faster mobilisation time of scientific monitoring resources, environmental benefit associated with faster mobilisation time would be minor compared to selected options. | Chartering and equipping additional vessels on standby for scientific monitoring has been considered. The option is reasonably practicable but the sacrifice (charter costs and organisational complexity) is significant, particularly when compared with the anticipated availability of vessels and resources within in the required timeframes. The selected delivery provides capability to meet the scientific monitoring objectives, including collection of pre-emptive data where baseline knowledge gaps are identified for receptor locations where spill predictions of time to contact are >10 days. The effectiveness of this alternative control (weather dependency, availability and survivability) is rated as very low<br>The cost and organisational complexity of employing a dedicated response vessel is considered disproportionate to the potential environmental benefit by adopting these delivery options. |

#### 6.6.2.2 Additional Control Measures

**Additional Control Measures considered**
*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures*

| Ref | Control Measure Category | Option considered | Implemented | Environmental Consideration | Feasibility / Cost |
|---|---|---|---|---|---|
| SM01 | System | Determine baseline data needs and provide implementation plan in the event of an unplanned hydrocarbon release | Yes | Address resourcing needs to collect post spill (pre-contact) baseline data as spill expands in the event of a loss of well containment from the PAP activities. | Woodside relies on existing environmental baseline for receptors which have predicted hydrocarbon contact (above environment threshold) <10 days and acquiring pre-emptive data in the event of an instantaneous marine diesel spill from the PAP activities based on receptors predicted to have hydrocarbon contact >10 days.<br>Ensure there is appropriate baseline for key receptors for all geographic locations that are potentially impacted <10 days of spill event, where practicable.<br>Address resourcing needs to collect pre-emptive baseline as spill expands in the event of an instantaneous marine diesel spill from the activities. |

### 6.6.3 Selected Control Measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected.
- Additional
  - Determine baseline data needs and activate SMPs for any identified PBAs in the event of an unplanned hydrocarbon release.
- Improved
  - None Selected.

### 6.6.4 Operational Plan

Key actions from the Scientific Monitoring Program Operational Plan for implementing the response are outlined in Table 6-4.

**Table 6-4: Scientific monitoring program operational plan actions**

| Responsibility | Action |
|---|---|
| **Activation** | |
| CIMT Planning<br>(CIMT Planning – Environment Unit) | Mobilise SMP Lead/Manager and SMP Coordinator to the CIMT Planning function. |
| CIMT Planning<br>(CIMT Planning – Environment Unit)<br>(SMP Lead/Manager and SMP Coordinator) | Constantly assess all outputs from OM01, OM02 and OM03 (**Section 5** and **ANNEX B**: Operational Monitoring Activation and Termination Criteria) to determine receptor locations and receptors at risk. Confirm sensitive receptors likely to be exposed to hydrocarbons, timeframes to specific receptor locations and which SMPs are triggered.<br>Review baseline data for receptors at risk. |
| CIMT Planning<br>CIMT Planning – Environment Unit)<br>(SMP Lead/Manager and SMP Coordinator) | SMP co-ordinator stands up the SMP contractor.<br>Stands up subject matter experts, if required. |
| CIMT Planning<br>(CIMT Planning – Environment Unit)<br>(SMP Lead/Manager SMP Coordinator, SMP standby contractor SMP manager) | Establish if, and where, pre-contact baseline data acquisition is required.<br>Determine practicable baseline acquisition program based on predicted timescales to contact and anticipated SMP mobilisation times.<br>Determine scope for preliminary post-contact surveys during the Response Phase.<br>Determine which SMP activities are required at each location based on the identified receptor sensitivities. |
| CIMT Planning<br>(CIMT Planning – Environment Unit)<br>(SMP Lead/Manager, SMP Coordinator, SMP standby contractor SMP manager) | If response phase data acquisition is required, stand up the contractor SMP teams for data acquisition and instruct them to standby awaiting further details for mobilisation from the CIMT. |
| CIMT Planning | SMP contractor, SMP standby contractor to prepare the Field Implementation Plan. |

| Responsibility | Action |
|---|---|
| (CIMT Planning – Environment Unit)<br><br>(SMP Lead/Manager, SMP Coordinator, SMP standby contactor SMP manager) | Prepare and obtain sign-off of the Response Phase SMP work plan and Field Implementation Plan.<br><br>Update the IAP. |
| CIMT Planning<br><br>(CIMT Planning – Environment Unit)<br><br>(SMP Lead/Manager, SMP Coordinator SMP standby contactor SMP manager) | Liaise with CIMT Logistics, and determine the status and availability of aircraft, vessels and road transportation available to transport survey personnel and equipment to point of departure.<br><br>Engage with SMP standby contactor SMP Manager and CIMT Logistics to establish mobilisation plan, secure logistics resources and establish ongoing logistical support operations, including:<br>• Vessels, vehicles and other logistics resources<br>• Vessel fit-out specifications (as<br>• Detailed in the Scientific Monitoring Program Operational Plan<br>• Equipment storage and pick-up locations<br>• Personnel pick-up/airport departure locations<br>• Ports of departure<br>• Land based operational centres and forward operations bases Accommodation and food requirements. |
| CIMT Planning<br><br>(CIMT Planning – Environment Unit)<br><br>(SMP Lead/Manager, SMP Coordinator, SMP standby contactor (SMP manager) | Confirm communications procedures between Woodside SMP team, SMP contractor SMP Duty Manager, SMP Team Leads and Operations Coordinator (CIMT). |
| **Mobilisation** | |
| CIMT Logistics | Engage vessels and vehicles and arrange fitting out as specified by the mobilisation Plan Confirm vessel departure windows and communicate with the SMP contractor SMP Duty Manager.<br><br>Agree SMP mobilisation timeline and induction procedures with the Operations Coordinator (CIMT). |
| CIMT Logistics | Coordinate with SMP contactor SMP Duty Manager to mobilise teams and equipment according to the logistics plan and Sector induction procedures. |
| SMP Survey Team Leads | SMP Survey Team Leader(s) coordinate on-ground/on-vessel mobilisations and support services with the Operations Coordinator (CIMT). |

### 6.6.5 ALARP and Acceptability Summary

| ALARP and Acceptability Summary | | |
|---|---|---|
| **Scientific Monitoring** | | |
| **ALARP Summary** | X | All known reasonably practicable control measures have been adopted |
| | X | Additional Measures: Determine baseline data needs and activate SMPs for any identified PBAs in the event of an unplanned hydrocarbon release |
| | | No reasonably practical additional, alternative, and/or improved control measure exists |
| | The resulting scientific monitoring capability has been assessed against the worst-case credible spill scenario. The range of strategies provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts.<br><br>All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be Moderate and the overall delivery effectiveness considered Medium. The SMP's main objectives can be met, with the addition of one alternative control measures to provide further benefit. | |
| **Acceptability Summary** | • The control measures selected for implementation manage the potential impacts and risks to ALARP.<br><br>• In the event of a hydrocarbon spill for the PAP, the control measures selected, meet or exceed the requirements of Woodside Management System and industry best-practice.<br><br>• Throughout the PAP, relevant Australian standards and codes of practice will be followed to evaluate the impacts from an instantaneous marine diesel spill.<br><br>• The level of impact and risk to the environment has been considered with regard to the principles of Environmentally Sustainable Development (ESD); and risks and impacts from a range of identified scenarios were assessed in detail. The control measures described consider the conservation of biological and ecological diversity, through both the selection of control measures and the management of their performance. The control measures have been developed to account for the worst-case credible case scenario, and uncertainty has not been used as a reason for postponing control measures. | |
| On the basis from the ALARP impact assessment above and in Section 6 of the EP Woodside considers the adopted controls discussed, manage the impacts and risks associated with implementing scientific monitoring activities to a level that is ALARP and acceptable. | | |

# 7 ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

The implementation of response techniques may modify the impacts and risks identified in the EP and response activities can introduce additional impacts and risks from response operations themselves. Therefore, it is necessary to complete an assessment to ensure these impacts and risks have been considered and specific measures are put in place to continually review and manage these further impacts and risks to ALARP and Acceptable levels. A simplified assessment process has been used to complete this task which covers the identification, analysis, evaluation and treatment of impacts and risks introduced by responding to the event.

## 7.1 Identification of impacts and risks from implementing response techniques

Each of the control measures can modify the impacts and risks identified in the EP. These impacts and risks have been previously assessed within the scope of the EP. Refer to the EP for details regarding how these risks are being managed. They are not discussed further in this document.

- Atmospheric emissions
- Routine and non-routine discharges
- Physical presence, proximity to other vessels (shipping and fisheries)
- Routine acoustic emissions vessels
- Lighting for night work/navigational safety
- Invasive marine species
- Collision with marine fauna
- Disturbance to seabed

Additional impacts and risks associated with the control measures not included within the scope of the EP include:

- Drill cuttings and drilling fluids environmental impact assessment for relief well drilling
- Vessel operations and anchoring
- Additional stress or injury caused to wildlife
- Waste generation.

## 7.2 Analysis of impacts and risks from implementing response techniques

The table below compares the adopted control measures for this activity against the environmental values that can be affected when they are implemented.

**Table 7-1: Analysis of risks and impacts**

| | Environmental Value | | | | | | |
|---|---|---|---|---|---|---|---|
| | Soil & Groundwater | Marine Sediment Quality | Water Quality | Air Quality | Ecosystems/ Habitat | Species | Socio-Economic |
| Monitor and evaluate | | ✓ | ✓ | | ✓ | ✓ | |
| Source control | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Oiled Wildlife | | | | | ✓ | ✓ | |
| Scientific Monitoring | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Waste Management | ✓ | | | ✓ | ✓ | ✓ | ✓ |

## 7.3 Evaluation of impacts and risks from implementing response techniques

### *Drill cuttings and drilling fluids environmental impact assessment for relief well drilling*

The identified potential impacts associated with the discharge of drill cuttings and fluids during a relief well drilling activity include a localised reduction in water and seabed sediment quality, and potential localised changes to benthic biota (habitats and communities).

A number of direct and indirect ecological impact pathways are identified for drill cuttings and drilling fluids as follows:

- temporary increase in total suspended solids (TSS) in the water column
- attenuation of light penetration as an indirect consequence of the elevation of TSS and the rate of sedimentation
- sediment deposition to the seabed leading to the alteration of the physio-chemical composition of sediments, and burial and potential smothering effects to sessile benthic biota
- potential contamination and toxicity effects to benthic and in-water biota from drilling fluids.

Potential impacts from the discharge of cuttings range from the complete burial of benthic biota in the immediate vicinity of the well site due to sediment deposition, smothering effects from raised sedimentation concentrations as a result of elevated TSS, changes to the physico-chemical properties of the seabed sediments (particle size distribution and potential for reduction in oxygen levels within the surface sediments due to organic matter degradation by aerobic bacteria) and subsequent changes to the composition of infauna communities to minor sediment loading above background and no associated ecological effects. Predicted impacts are generally confined to within a few hundred metres of the discharge point (International Association of Oil and Gas Producers 2016) (i.e. within the EMBA for a hydrocarbon spill event).

The discharge of drill cuttings and unrecoverable fluids from relief well drilling is expected to increase turbidity and TSS levels in the water column, leading to an increased sedimentation rate above ambient levels associated with the settlement of suspended sediment particles in close proximity to the seabed or below sea surface, depending on location of discharge. Cuttings with retained (unrecoverable) drilling fluids are discharged below the water line at the MODU location, resulting in drill cuttings and drilling fluids rapidly diluting, as they disperse and settle through the water column. The dispersion and fate of the cuttings is determined by

particle size and density of the retained (unrecoverable) drilling fluids, therefore, the sediment particles will primarily settle in proximity to the well locations with potential for localised spread downstream (depending on the speed of currents throughout the water column and seabed) (IOGP 2016). The finer particles will remain in suspension and will be transported further before settling on the seabed.

These conclusions were supported by discharge modelling which was undertaken by Woodside in support of the Greater Enfield Development EP. Modelling results indicating that the TSS plume of suspended cuttings will typically disperse to the south-west while oscillating with the tide and diminish rapidly with increasing distance from the well locations. Maximum TSS concentrations predicted for 100 m; 250 m and 1 km distances from the wellsite were 7, 5 and 1 mg/L, respectively. Furthermore, water column concentrations below 10 mg/L remain within 235 m of the discharge location for each modelled well. For all well discharge locations (outside of direct discharge sites), TSS concentration did not exceed 10 mg/l. Nelson et al. (2016) identified <10 mg/L as a no effect or sub-lethal minimal effect concentration.

The low sensitivity of the deep-water benthic communities/habitats within and in the vicinity of relief well locations, combined with the relatively low toxicity of water based muds (WBM) and non-water based muds (NWBMs), there being no bulk discharges of NWBM and the highly localised nature and scale of predicted physical impacts to seabed biota, indicate that any localised impact would likely be of a slight magnitude (especially when considering the broader consequence of the loss of well containment event that a relief well drilling activity would be responding too).

***Vessel operations and anchoring***

During the implementation of response techniques, where water depths allow, it is possible that response vessels will be required to anchor (e.g. during shoreline surveys and oiled wildlife response). The use of vessel anchoring will be minimal and likely to occur when the impacted shoreline is inaccessible via road. Anchoring in the nearshore environment of sensitive receptor locations will have the potential to impact coral reef, seagrass beds and other benthic communities in these areas. Recovery of benthic communities from anchor damage depends on the size of anchor and frequency of anchoring. Impacts would be highly localised (restricted to the footprint of the vessel anchor and chain) and temporary, with full recovery expected.

***Additional stress or injury caused to wildlife***

Additional stress or injury to wildlife could be caused through the following phases of a response:

- capturing wildlife
- transporting wildlife
- stabilisation of wildlife
- cleaning and rinsing of oiled wildlife
- rehabilitation (e.g. diet, cage size, housing density)
- release of treated wildlife.

Inefficient capture techniques have the potential to cause undue stress, exhaustion or injury to wildlife, additionally pre-emptive capture could cause undue stress and impacts to wildlife when there are uncertainties in the forecast trajectory of the spill. During the transportation and stabilisation phases there is the potential for additional thermoregulation stress on captured wildlife. Additionally, during the cleaning process, it is important personnel undertaking the tasks are familiar with the relevant techniques to ensure that further injury and the removal of water proofing feathers are managed and mitigated. Finally, during the release phase it's important that wildlife is not released back into a contaminated environment.

***Waste generation***

Implementing oiled wildlife response may result in the generation of the following waste streams that will require management and disposal:

- Liquids (recovered oil/water mixture), recovered from oiled wildlife response operations
- Semi-solids/solids (oily solids), collected during oiled wildlife response operations
- Debris collected during oiled wildlife response.

If not managed and disposed of correctly, wastes generated during the response have the potential for secondary contamination, impacts to wildlife through contact with or ingestion of waste materials and contamination risks if not disposed of correctly onshore.

## 7.4 Treatment of impacts and risks from implementing response techniques

In respect of the impacts and risks assessed the following treatment measures have been adopted. It must be recognised that this environmental assessment is seeking to identify how to maintain the level of impact and risks at levels that are ALARP and of an acceptable level rather than exploring further impact and risk reduction. It is for this reason that the treatment measures identified in this assessment will be captured in Operational Plans, Tactical Response Plans (ANNEX E: Tactical Response Plans), and/or First Strike Plans.

***Vessel operations and anchoring***

- If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic primary producer habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified (PS 7.1, PS 14.1).
- Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines (PS 7.2, PS14.2).

***Additional stress or injury caused to wildlife***

- Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA and in accordance with the processes and methodologies described in the WA OWRP and the relevant regional plan (PS 13.3).

***Waste generation***

- Response teams will segregate liquid and solid wastes at the earliest opportunity (PS 15.4).

# 8 ALARP CONCLUSION

An analysis of alternative, additional and improved control measures has been undertaken to determine their reasonableness and practicability. The tables in **Section 6** document the considerations made in this evaluation. Where the costs of an alternative, additional, or improved control measure have been determined to be clearly disproportionate to the environmental benefit gained from its adoption it has been rejected. Where this is not considered to be the case the control measure has been adopted.

The risks from a hydrocarbon spill have been reduced to ALARP because:

- Woodside has a significant hydrocarbon spill response capability to respond to the WCCS through the control measures identified.
- New and modified impacts and risks associated with implementing response techniques have been considered and will not increase the risks associated with the activity.
- A consideration of alternative, additional, and improved control measures identified any other control measures that delivered proportionate environmental benefit compared to the cost of adoption for this activity ensuring that:
    - All known, reasonably practicable control measures have been adopted.
    - No additional, reasonably practicable alternative and/or improved control measures would provide further environmental benefit.
    - No reasonably practical additional, alternative, and/or improved control measure exists.
- A structured process for considering alternative, additional, and improved control measures was completed for each control measure.
- The evaluation was undertaken based on the outputs of the WCCS so that the capability in place is sufficient for all other scenario from this activity.
- The likelihood of the WCCS spill has been ignored in evaluating what was reasonably practicable.

# 9 ACCEPTABILITY CONCLUSION

Following the ALARP evaluation process, Woodside deems the hydrocarbon spill risks and impacts to have been reduced to an acceptable level by meeting all of the following criteria:

- Techniques are consistent with Woodside's processes and relevant internal requirements including policies, culture, processes, standards, structures and systems.
- Levels of risk/ impact are deemed acceptable by relevant persons/ organisations and are aligned with the uniqueness of, and/or the level of protection assigned to the environment, its sensitivity to pressures introduced by the activity, and the proximity of activities to sensitive receptors, and have been aligned with Part 3 of the EPBC Act.
- Selected control measures meet requirements of legislation and conventions to which Australia is a signatory (e.g. International Convention for the Prevention of Pollution from Ships (MARPOL), the World Heritage Convention, the Ramsar Convention, and the Biodiversity Convention etc.). In addition to these, other non-legislative requirements met include:
    - Australian IUCN reserve management principles for Commonwealth marine protected areas and bioregional marine plans.
    - National Water Quality Management Strategy and supporting guidelines for marine water quality).
    - Conditions of approval set under other legislation.
    - National and international requirements for managing pollution from ships.
    - National biosecurity requirements.
- Industry standards, best practices and widely adopted standards and other published materials have been used and referenced when defining acceptable levels. Where these are inconsistent with mandatory/ legislative regulations, explanation has been provided for the proposed deviation. Any deviation produces the same or a better level of environmental performance (or outcome).

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# 11 GLOSSARY & ABBREVIATIONS

## 11.1 Glossary

| Term | Description / Definition |
|---|---|
| ALARP | Demonstration through reasoned and supported arguments that there are no other practicable options that could reasonably be adopted to reduce risks further. |
| Availability | The availability of a control measure is the percentage of time that it is capable of performing its function (operating time plus standby time) divided by the total period (whether in service or not). In other words, it is the probability that the control has not failed or is undergoing a maintenance or repair function when it needs to be used. |
| Control | The means by which risk from events is eliminated or minimised. |
| Control effectiveness | A measure of how well the control measures perform their required function. |
| Control measure (risk control measure) | The features that eliminate, prevent, reduce or mitigate the risk to environment associated with PAP. |
| Credible spill scenario | A spill considered by Woodside as representative of maximum volume and characteristics of a spill that could occur as part of the PAP. |
| Dependency | The degree of reliance on other systems in order for the control measure to be able to perform its intended function. |
| Incident | An event where a release of energy resulted in or had (with) the potential to cause injury, ill health, damage to the environment, damage to equipment or assets or company reputation. |
| Major Environment Event | The events with potential environment, reputation, social or cultural consequences of category C or higher (as per Woodside's operational risk matrix) which are evaluated against credible worst-case scenarios which may occur when all controls are absent or have failed. |
| Performance outcome | A statement of the overall goal or outcome to be achieved by a control measure |
| Performance standard | The parameters against which [risk] controls are assessed to ensure they reduce risk to ALARP.<br>A statement of the key requirements (indicators) that the control measure has to achieve in order to perform as intended in relation to its functionality, availability, reliability, survivability and dependencies. |
| Preparedness | Measures taken before an incident in order to improve the effectiveness of a response |
| Reasonably practicable | ... a computation ... made by the owner, in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) [showing whether or not] that there is a gross disproportion between them ... made by the owner at a point of time anterior to the accident.<br>(Judgement: Edwards v National Coal Board [1949]) |
| Receptors at risk | Physical, biological and social resources identified as at risk from hydrocarbon contact using oil spill modelling predictions. |
| Receptor areas | Geographically referenced areas such as bays, islands, coastlines and/or protected area (World Heritage Area, WHA, Commonwealth or State marine reserve or park) containing one or more receptor type. |
| Receptor Sensitivities | This is a classification scheme to categorise receptor sensitivity to an oil spill. The Environmental Sensitivity Index (ESI) is a numerical classification of the relative sensitivity of a particular environment (particularly different shoreline types) to an oil spill. Refer to the Woodside Oil Pollution Emergency Arrangements (Australia) for more details. |
| Regulator | NOPSEMA are the Environment Regulator under the Environment Regulations. |

| Term | Description / Definition |
|---|---|
| Reliability | The probability that at any point in time a control measure will operate correctly for a further specified length of time. |
| Response technique | The key priorities and objectives to be achieved by the response plan<br>Measures taken in response to an event to reduce or prevent adverse consequences. |
| Survivability | Whether or not a control measure is able to survive a potentially damaging event is relevant for all control measures that are required to function after an incident has occurred. |
| Threshold | Hydrocarbon threshold concentrations applied to the risk assessment to evaluate hydrocarbon spills. These are defined as: surface hydrocarbon concentration – ≥10 g/m$^2$, dissolved – ≥100 ppb and entrained hydrocarbon concentrations – ≥500 ppb. |
| EMBA | The summary of quantitative modelling where the marine environment could be exposed to hydrocarbons levels exceeding hydrocarbon threshold concentrations. |
| Zone of Application (ZoA) | The zone in which Woodside may elect to apply dispersant. The zone is determined based on a range of considerations, such as hydrocarbon characteristics, weathering and metocean conditions. The zone is a key consideration in the Net Environmental Benefit Analysis for dispersant use. |

## 11.2 Abbreviations

| Abbreviation | Meaning |
|---|---|
| AHV | Anchor Handler Vessel |
| AIIMS | Australasian Inter-Service Incident Management System |
| ALARP | As low as reasonably practicable |
| AMOSC | Australian Marine Oil Spill Centre |
| AMP | Australian Marine Park |
| AMSA | Australian Maritime Safety Authority |
| API | American Petroleum Institute |
| APPEA | Australian Petroleum Production & Exploration Association |
| AUV | Autonomous Underwater Vehicle |
| BAOAC | Bonn Agreement Oil Appearance Code |
| BOP | Blowout Preventer |
| BOPE | Blowout Preventer Equipment |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CF | Condition Factor |
| CFD | Computational Fluid Dynamic |
| CIMT | Corporate Incident Management Team |
| CMT | Crisis Management Team |
| COP | Common Operating Picture |
| CS | Credible Scenario |
| DBCA | Department of Biodiversity, Conservation and Attractions (former Department of Parks and Wildlife) |
| DISC | Drilling Industry Steering Committee |
| DM | Duty Manager |
| DNA | Deoxyribonucleic Acid |
| DoT | Department of Transport |
| DP | Dynamically Positioned |
| EMBA | Environment that May Be Affected |
| EMSA | European Maritime Safety Agency |
| EP | Environment Plan |
| EPBC | Environment Protection and Biodiversity Conservation |
| EROD | ethoxyresorufin-O-deethylase |
| ESI | Environmental Sensitivity Index |
| ESD | Environmentally Sustainable Development |
| ESP | Environmental Services Panel |
| FSP | First Strike Plan |
| FST | Functional Support Team |
| GIS | Geographic Information System |
| GSI | Gonadosomatic Index |
| HSE | Health Safety and Environment |

| Abbreviation | Meaning |
|---|---|
| HSEQ | Health Safety Environment and Quality |
| HSP | Hydrocarbon Spill Preparedness |
| IAP | Incident Action Plan |
| IC | Incident Controller |
| ICE | Internal Control Environment |
| ID | Identification |
| IGEM | Industry-Government Environmental Meta-database |
| IMIS | Incident Management Information System |
| IMS | Incident Management System |
| IMO | International Marine Organisation |
| IMT | Incident Management Team |
| IPIECA | International Petroleum Industry Environment Conservation Association |
| IR | Infrared |
| ISV | Infield Support Vessels |
| ITOPF | International Tanker Owners Pollution Federation |
| IUCN | International Union for Conservation of Nature |
| KBSB | King Bay Support Base |
| KGP | Karratha Gas Plant |
| LEL | Lower Explosive Limit |
| LOWC | Loss Of Well Control |
| LSI | Liver Somatic Index |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MODU | Mobile Offshore Drilling Unit |
| MoU | Memorandum of Understanding |
| MSRC | Marine Spill Response Corporation |
| NATA | National Association of Testing Authorities |
| NEBA | Net Environmental Benefit Analysis |
| NOAA | National Oceanic and Atmospheric Administration |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority |
| NRDA | Natural Resource Damage Assessment |
| NWBM | Non-Water Based Muds |
| OIE | Offset Installation Equipment |
| OILMAP | Oil Spill Model and Response System |
| OM | Operational Monitoring |
| OMP | Operational Monitoring Program |
| OPEA | Oil Pollution Emergency Arrangements |
| OPEP | Oil Pollution Emergency Plan |
| OPGGS | Offshore Petroleum and Greenhouse Gas Storage |
| OSPRMA | Oil Spill Preparedness and Response Mitigation Assessment |

| Abbreviation | Meaning |
|---|---|
| OSRL | Oil Spill Response Limited |
| OSRO | Oil Spill Response Organisation |
| OSTM | Oil Spill Trajectory Modelling |
| OWR | Oiled Wildlife Response |
| OWRP | Oiled Wildlife Response Plan |
| OWROP | Oiled Wildlife Response Operational Plan |
| QA/QC | Quality Assurance/Quality Control |
| PAH | Polyaromatic Hydrocarbon |
| PAP | Petroleum Activities Program |
| PBA | Pre-emptive Baseline Areas |
| PPB | Parts per billion |
| PS | Performance Standard |
| ROV | Remotely Operated Vehicle(s) |
| RPA | Response Protection Area |
| S&EM | Security and Emergency Management |
| SCAT | Shoreline Contamination Assessment Techniques |
| SCERP | Source Control Emergency Response Plan |
| SDH | Sorbitol Dehydrogenase |
| SFRT | Subsea First Response Toolkit |
| SIMAP | Spill Impact Mapping and Analysis Program |
| SIMOPS | Simultaneous Operations |
| SM | Scientific Monitoring |
| SME | Subject Matter Expert |
| SMP | Scientific Monitoring Program |
| SOPEP | Shipboard Oil Pollution Emergency Plan |
| SQGV | Sediment Quality Guideline Values |
| TOA | Testing of Arrangements |
| TRP | Tactical Response Plan |
| TRSV | Tubing Retrievable Safety Valve |
| TSS | Total Suspended Solids |
| UV | Ultraviolet |
| WA DoT | Western Australia Department of Transport |
| WBM | Water Based Muds |
| WCCS | Worst Case Credible Scenario |
| WHA | World Heritage Area |
| WMS | Woodside Management System |
| WiRCs | Woodside Integrated Risk & Compliance System |
| Woodside | Woodside Energy Limited |
| WWCI | Wild Well Control Inc |

| Abbreviation | Meaning |
|---|---|
| ZoA | Zone of Application |